Northeast Fisheries Science Center Reference Document 10-21

12th Flatfish Biology Conference 2010
Program and Abstracts

December 1-2 2010
Water's Edge Resort and Spa, Westbrook, CT

by Conference Steering Committee: Renee Mercaldo-Allen (Chair), Anthony Calabrese, Donald Danila, Mark Dixon, Ambrose Jearld, Thomas Munroe, Deborah Pacileo, Christopher Powell, and Sandra Sutherland

October 2010

Recent Issues in This Series

09-17 *Stock assessment of summer flounder for 2009*, by M Terceiro. October 2009.

09-18 *Stock assessment of scup for 2009*, by M Terceiro. October 2009.

09-19 *Proration of Estimated Bycatch of Loggerhead Sea Turtles in U.S. Mid-Atlantic Sink Gillnet Gear to Vessel Trip Report Landed Catch, 2002-2006*, by KT Murray. November 2009

09-20 *River Herring Discard Estimation, Precision, and Sample Size Analysis*, by SE Wigley, J Blaylock, and P Rago. December 2009.

10-01 *49th Northeast Regional Stock Assessment Workshop (49th SAW) assessment summary report*, by Northeast Fisheries Science Center. January 2010.

10-02 *A Standard Method to Apportion Groundfish Catch to Stock Area for the Purpose of Real Time Quota Monitoring under Amendment 16*, by Michael C. Palmer. January 2010.

10-03 *49th Northeast Regional Stock Assessment Workshop (49th SAW) Assessment Report*, by Northeast Fisheries Science Center. February 2010.

10-04 *Brodeur's Guide to Otoliths of Some Northwest Atlantic Fishes*, edited by R.S. McBride, J.W. Hauser, and S.J. Sutherland. May 2010.

10-05 *Estimation of Albatross IV to Henry B. Bigelow calibration factors*, by Miller TJ, Das C, Politis PJ, Miller AS, Lucey SM, Legault CM, Brown RW, Rago PJ. May 2010.

10-06 *Biological Reference Points for Spiny Dogfish*, by PJ Rago and KA Sosebee. May 2010.

10-07 *North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2009 Results Summary*, by C Khan, T Cole, P Duley, A Glass, and J Gatzke. May 2010.

10-08 In preparation.

10-09 *50th Northeast Regional Stock Assessment Workshop (50th SAW): Assessment Summary Report*, by Northeast Fisheries Science Center. July 2010.

10-10 *Estimates of Cetacean and Pinniped Bycatch in the 2007 and 2008 Northeast Sink Gillnet and Mid-Atlantic Gillnet Fisheries*, by CM Orphanides. July 2010.

10-11 *Northeast Fisheries Science Center Cetacean Biopsy Training Manual*, by F Wenzel, J Nicolas, F Larsen, and RM Pace III. July 2010.

10-12 *A Survey of Social Capital and Attitudes toward Management in the New England Groundfish Fishery*, by DS Holland, P Pinto da Silva, and J Wiersma. July 2010.

10-13 *Black Sea Bass 2010 Stock Assessment Update*, by GR Shepherd and J Nieland. July 2010.

10-14 *Stock Assessment of Summer Flounder for 2010*, by M Terceiro. July 2010.

10-15 *Bluefish 2010 Stock Assessment Update*, by GR Shepherd and J Nieland. July 2010.

10-16 *Stock Assessment of Scup for 2010*, by M Terceiro. July 2010.

10-17 *50th Northeast Regional Stock Assessment Workshop (50th SAW) Assessment Report*, by Northeast Fisheries Science Center. August 2010.

10-18 *An Updated Spatial Pattern Analysis for the Gulf of Maine-Georges Bank Atlantic Herring Complex during 1963-2009*, by JJ Deroba. August 2010.

10-19 *International Workshop on Bioextractive Technologies for Nutrient Remediation Summary Report*, by JM Rose, M Tedesco, GH Wikfors, C Yarish. August 2010.

10-20 *Northeast Fisheries Science Center Publications, Reports, Abstracts, and Web Documents for Calendar Year 2009*, by A Toran. September 2010.

Northeast Fisheries Science Center Reference Document 10-21

12th Flatfish Biology Conference 2010 Program and Abstracts

December 1-2 2010
Water's Edge Resort and Spa, Westbrook, CT

by Conference Steering Committee: Renee Mercaldo-Allen (Chair)[1], Anthony Calabrese (retired)[1], Donald Danila[2], Mark Dixon[1], Ambrose Jearld [3], Thomas Munroe[4], Deborah Pacileo[5], Christopher Powell (retired)[6], and Sandra Sutherland[3]

[1]NOAA NMFS Northeast Fisheries Science Center, 212 Rogers Avenue, Milford CT 06460
[2]Dominion Nuclear Connecticut, Inc., Millstone Environmental Laboratory, Waterford, CT 06385
[3]NOAA NMFS Northeast Fisheries Science Center, 166 Water Street, Woods Hole, MA 02543
[4]National Systematics Laboratory, NOAA NMFS, Smithsonian Institution, PO Box 37012, NHB WC 57 MRC-153, Washington, DC 20013-7012
[5]Connecticut Department of Environmental Protection, Marine Fisheries Division, PO Box 719, Old Lyme, CT 06371
[6]Rhode Island Department of Environment Management, Marine Fisheries Section, 3 Ft. Wetherill Road, Jamestown, RI 02835

US DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, Massachusetts

October 2010

Northeast Fisheries Science Center Reference Documents

This series is a secondary scientific series designed to assure the long-term documentation and to enable the timely transmission of research results by Center and/or non-Center researchers, where such results bear upon the research mission of the Center (see the outside back cover for the mission statement). These documents receive internal scientific review, and most receive copy editing. The National Marine Fisheries Service does not endorse any proprietary material, process, or product mentioned in these documents.

All documents issued in this series since April 2001, and several documents issued prior to that date, have been copublished in both paper and electronic versions. To access the electronic version of a document in this series, go to *http://www.nefsc.noaa.gov/nefsc/publications/*. The electronic version is available in PDF format to permit printing of a paper copy directly from the Internet. If you do not have Internet access, or if a desired document is one of the pre-April 2001 documents available only in the paper version, you can obtain a paper copy by contacting the senior Center author of the desired document. Refer to the title page of the document for the senior Center author's name and mailing address. If there is no Center author, or if there is corporate (*i.e.*, non-individualized) authorship, then contact the Center's Woods Hole Laboratory Library (166 Water St., Woods Hole, MA 02543-1026).

Editorial Treatment: To distribute this report quickly, it has not undergone the normal technical and copy editing by the Northeast Fisheries Science Center's (NEFSC's) Editorial Office as have most other issues in the NOAA Technical Memorandum NMFS-NE series. Other than the four covers and first two preliminary pages, all writing and editing have been performed by the authors listed within.

Information Quality Act Compliance: In accordance with section 515 of Public Law 106-554, the Northeast Fisheries Science Center completed both technical and policy reviews for this report. These predissemination reviews are on file at the NEFSC Editorial Office.

This document may be cited as:

Mercaldo-Allen R, Calabrese A, Danila D, Dixon M, Jearld A, Munroe T, Pacileo D, Powell C, Sutherland S. 2010. 12th Flatfish Biology Conference 2010 Program and Abstracts. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 10-21; 70 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://www.nefsc.noaa.gov/nefsc/publications/

Acknowledgements

Conference Convened By
NOAA's National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, MA

Printing Courtesy of
NOAA's National Marine Fisheries Service/NEFSC/Woods Hole Laboratory
Woods Hole, MA

Northeast Fisheries Science Center Reference Document
Jarita Davis
NOAA's National Marine Fisheries Service/NEFSC/Woods Hole Laboratory
Woods Hole, MA

Booklet Assembly
Heather Fletcher
NOAA's National Marine Fisheries Service/NEFSC/Woods Hole Laboratory
Woods Hole, MA

Logo Design
Catherine Kuropat
NOAA's National Marine Fisheries Service/NEFSC/Milford Laboratory
Milford, CT

Conference Webpage
Ronald Goldberg
NOAA's National Marine Fisheries Service/NEFSC/Milford Laboratory
Milford, CT

Administrative Support
Sylvia Feeney
Carletta Wright Sipes

Co-sponsored by

Dominion
Richmond, VA
Millstone Environmental Laboratory
Waterford, CT

Southern New England Chapter
American Fisheries Society

Conference Steering Committee

Anthony Calabrese
NOAA's National Marine Fisheries Service/NEFSC/Milford Laboratory (Retired)
Milford, CT

Donald Danila
Dominion Nuclear Connecticut, Inc., Millstone Environmental Laboratory
Waterford, CT

Mark Dixon
NOAA's National Marine Fisheries Service/NEFSC/Milford Laboratory
Milford, CT

Ambrose Jearld
NOAA's National Marine Fisheries Service/NEFSC/Woods Hole Laboratory
Woods Hole, MA

Renee Mercaldo-Allen (Chair)
NOAA's National Marine Fisheries Service/NEFSC/Milford Laboratory
Milford, CT

Thomas Munroe
NOAA's National Marine Fisheries Service/NEFSC/National Systematics Laboratory
Washington, DC

Deborah Pacileo
Connecticut Department of Environmental Protection
Marine Fisheries Division
Old Lyme, CT

Christopher Powell
Rhode Island Division of Environmental Management (Retired)
Jamestown, RI

Sandra Sutherland
NOAA's National Marine Fisheries Service/NEFSC/Woods Hole Laboratory
Woods Hole, MA

12th Flatfish Biology Conference
2010

December 1st & 2nd
Water's Edge Resort and Spa, Westbrook, CT

Oral Presentations
Salons A/B

Wednesday, December 1st

7:30 a.m. **Registration/Coffee, Continental Breakfast**

8:00 a.m. Welcome and Introduction
Renee Mercaldo-Allen, Chair
NOAA's National Marine Fisheries Service
Northeast Fisheries Science Center
Milford, CT

Frank Almeida, Deputy Science and Research Director
NOAA's National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, MA

Session I
Donald Danila, Chair
Dominion/Millstone Environmental Laboratory, Waterford, CT

8:20 a.m. Seasonal Patterns in Body Condition and Proximate Composition for Three Flatfishes: Winter, Yellowtail and Summer Flounder
Mark Wuenschel*, Dave McElroy, and Richard McBride
NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole Laboratory, Woods Hole, MA

8:40 a.m. Spawning Survey of Southern and Gulf Flounder (*Paralichthys lethostigma* and *P. albigutta*) using Scuba Off the South Carolina Coast
Charles Tucker
College of Charleston, Department of Biology, Grice Marine Laboratory, Charleston, SC

9:00 a.m. Potential Effects of Changing Winter Climate on Suitability of Summer Flounder Spawning Grounds in the Mid-Atlantic Bight

John Manderson[1*], Linda Stehlik[1], Donglai Gong[2], Josh Kohut[2], and Beth Phelan[1]

[1]NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center, James J. Howard Marine Laboratory, Highlands, NJ, [2]Rutgers University, Institute of Marine and Coastal Sciences, New Brunswick, NJ

9:20 a.m. Distribution and Abundance of Winter Flounder in The Great South Channel

Greg DeCelles*, Sally Roman, David Martins, Anthony Wood, and Steve Cadrin

University of Massachusetts Dartmouth, School for Marine Science and Technology, Fairhaven, MA

9:40 a.m. Does Temperature Play a Role in Long-term Patterns? Use of an Intertidal Salt Marsh Basin by Flatfishes in South Carolina

Mary Carla Curran[1*], Andrew Solow[2], and Dennis Allen[3]

[1]Savannah State University, Marine Science Program, Department of Natural Sciences, Savannah, GA, [2]Woods Hole Oceanographic Institution, Marine Policy Center, Woods Hole, MA, [3]University of South Carolina, The Belle W. Baruch Institute for Marine and Coastal Sciences, Georgetown, SC

10:00 a.m. **Break/Coffee/Refreshments**

Session II

Sandra Sutherland, Chair

NOAA's National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, MA

10:20 a.m. Case Studies in Flatfish Stock Enhancement: Evaluating the Impact of Acclimation Cage Conditioning for Japanese Flounder, *Paralichthys olivaceus* in Wakasa Bay, Japan

Michelle Walsh[1, 2*], Hiroshi Fujimoto[3], Takeo Yamamoto[3], Tatsuya Yamada[3], Youiti Takahashi[3], and Yoh Yamashita[2]

[1]University of New Hampshire, Department of Biological Science, Durham, NH, [2]Kyoto University, Graduate School of Agriculture, Maizuru Fisheries Research Station, Maizuru, Kyoto, Japan, [3]National Center for Stock Enhancement, Fisheries Research Agency, Fukui, Japan

10:40 a.m. Effect of Mesh Size, Shape, and Codend Attachments on Size Selectivity of Four Species of Flounder in Gulf of Maine Groundfish Trawls
Pingguo He
University of Massachusetts Dartmouth, School for Marine Science and Technology, Department of Fisheries Oceanography, New Bedford, MA

11:00 a.m. Spawning Movements and Habitat Use of Winter Flounder in the Southern Gulf of Maine
Elizabeth Fairchild
University of New Hampshire, Department of Biological Sciences, Durham, NH

11:20 a.m. Interfacing Systematics and Fisheries Biology: A New Zealand Example (Rhombosoleidae: *Peltorhamphus novaezeelandiae*)
Thomas Munroe
NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center, National Systematics Laboratory, Smithsonian Institution, Washington, DC

11:40 a.m. 30 Years on the Niantic River: Looking Back at Millstone Winter Flounder Studies
Donald Danila
Dominion Resources Services, Millstone Environmental Laboratory, Waterford, CT

12:00 p.m. Using Winter Flounder Otoliths to Evaluate Habitat Quality and Test the Feasibility of Stock Discrimination and Movement Patterns between George's Bank and SNE/MAB Stocks using Laser Ablation and Synchrotron X-ray Fluorescence
George Jackman[1*], Karin Limburg[2], and John Waldman[3]
[1]City University of New York, Graduate Center, New York, NY, [2]State University of New York, College of Environmental Science and Forestry, Syracuse, NY, [3]City University of New York, Queens College, Flushing, NY

12:20 p.m. **Hosted Buffet Lunch**

Session III

Ambrose Jearld, Chair
NOAA's National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, MA

1:20 p.m. Application of Reflex Action Mortality Predictors to Estimate Discard Mortality of Yellowtail Flounder
Adam Barkley* and Steve Cadrin
University Of Massachusetts Dartmouth, School for Marine Science and Technology, Fairhaven, MA

1:40 p.m. Where Have All the Winter Flounder (*Pseudopleuronectes americanus*) Gone?
Timothy Visel
The Sound School Regional Vocational Aquaculture Center, New Haven, CT

2:00 p.m. Movement of Summer Flounder (*Paralicthys dentatus*) in Relation to Hypoxia in an Estuarine Tributary
Margaret Miller* and Timothy Targett
University of Delaware, School of Marine Science and Policy, Lewes, DE

2:20 p.m. Elucidating the Early Life History of *Pleuronectes platessa* in the Northern Irish Sea Using Otolith Microstructural Analysis
Melanie Zölck
Galway-Mayo Institute of Technology, Marine and Freshwater Research Centre, Commercial Fisheries Research Group, Department of Life Science, Galway, Ireland

2:40 p.m. Transport and Fate of Winter Flounder Eggs in Highly Modified Port and Harbor Settings
Douglas Clarke[1*], Tahirih Lackey[2], Jarrell Smith[2], and Sung-Chan Kim[2]
[1]Environmental Laboratory, [2]Coastal and Hydraulics Laboratory, US Army Engineer Research and Development Center, Vicksburg, MS

3:00 p.m. An Assessment of the Flounder (*Paralichthys spp.)* Gig Fishery in South Carolina
Eric Hiltz*, Brad Floyd, Marcel Reichert, and Julia Byrd
South Carolina Department of Natural Resource, Marine Resources Division, Charleston, SC

3:20 p.m. **Refreshment Break**

Session IV

Thomas Munroe, Chair
NOAA's National Marine Fisheries Service
National Systematics Laboratory
Washington, DC

3:40 p.m. Environmental Factors Effecting Coastal Benthic Communities: A Case Study Incorporating Biomarkers, Biofilms and Parasite Prevalence
Laura Langan
Commercial Fisheries Research Group, Marine and Freshwater Research Centre, Galway Mayo Institute of Technology, Galway, Ireland

4:00 p.m. The Effects of the Invasive Ascidian *Didemnum vexillum* on the Benthic Macrofauna and Feeding Habits of Winter Flounder (*Pseudopleuronectes americanus*) on Northern Georges Bank
Brian Smith[1*], Jeremy Collie[2], and Nicole Lengyel[2]
[1]NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole Laboratory, Woods Hole, MA, [2]University of Rhode Island, Graduate School of Oceanography, Narragansett, RI

4:20 p.m. The Use of Acoustic Telemetry as a Means of Assessing Discard Mortality in the Summer Flounder (*Paralichthys dentatus*) Commercial Fishery: A First Look
Mathew Yergey*, Kenneth Able and Thomas Grothues
Rutgers University Marine Field Station, Institute of Marine and Coastal Sciences, Tuckerton, NJ

4:40 p.m. Winter Flounder Maturation between Stocks and Years: An AIC Analysis of Female Maturity Ogives Based on Gonad Histology
Richard McBride*, Mark Wuenschel, and Paul Nitschke
NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole Laboratory, Woods Hole, MA

5:00 p.m. Examination of Monthly Oocyte Development and Spawning Patterns in Gulf of Maine Winter Flounder, *Pseudopleuronectes americanus*, by Macroscopic and Histological Methodologies
Yvonna Rowinski*, Dave McElroy, Mark Wuenschel, and Richard McBride
NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole Laboratory, Woods Hole, MA

5:20 p.m. The Winter Flounder Baby Book: A Parody (A 9-minute Film)
Michelle Walsh[1, 2] and Stacy Farina[1]
[1]University of New Hampshire, Department of Biological Sciences, Durham, NH, [2]Kyoto University, Maizuru Fisheries Research Station, Kyoto, Japan

5:40 p.m. **Poster Set-up**

6:00 p.m. **Hosted Mixer and Poster Session**

Thursday December 2nd

7:30 a.m. **Registration/Coffee/Continental Breakfast**

Session V
Christopher Powell, Chair (retired)
Rhode Island Division of Environmental Management
Division of Fish and Wildlife, Marine Fisheries, Jamestown, RI

8:00 a.m. Burial in Winter Flounder (*Pseudopleuronectes americanus*): Understanding Limits to Telemetry Success
Thomas Grothues* and Kenneth Able
Rutgers University Marine Field Station, Institute of Marine and Coastal Sciences, Tuckerton, NJ

8:20 a.m. Abundance, Growth, and Diet of Juvenile Summer Flounder (*Paralichthys dentatus*) and Winter Flounder (*Pseudopleuronectes americanus*) in Narragansett Bay RI/MA
Carissa Gervasi* and David Taylor
Roger Williams University, Department of Marine Biology, Bristol, RI

8:40 a.m. Associations between Temperature and Winter Flounder, *Pseudopleuronectes americanus*: Egg and Larval Distributions in New York/New Jersey Harbor
Dara Wilber[1*], Douglas Clarke[2], David Davis[3], Sarah Zappala[3], Catherine Mulvey[4], Ann Marie DiLorenzo[4] and Jenine Gallo[4]
[1]Bowhead Information Technology Services, Charleston, SC, [2] US Army Engineer Research and Development Center, Vicksburg, MS, [3]Henningson, Durham and Richardson Engineering, Inc., Pearl River, NY [4]US Army Corps of Engineers New York District, New York, NY

9:00 a.m. Multi-decadal Abundance of Hogchokers (Achiridae: *Trinectes maculatus*) in Lower Chesapeake Bay and Its Tributaries
G. Hank Brooks[1*], Thomas Munroe[2], and Troy Tuckey[1]
[1]College of William and Mary, Department of Fisheries, Virginia Institute of Marine Science, Gloucester Point, VA, [2]NOAA's National Marine Fisheries Service, National Systematics Laboratory, Smithsonian Institution, Washington, DC

9:20 a.m. Evaluation of Winter Flounder Larvae in Narragansett Bay, Rhode Island from 2001-2008

Grace Klein-MacPhee*, Eric Schneider, and Najih Lazar
Rhode Island Department of Environmental Management, Division of Fish and Wildlife-Marine Fisheries, Coastal Fisheries Laboratory, Jamestown RI

9:40 a.m. Investigations into Atlantic Halibut (*Hippoglossus hippoglossus*) Behavior and Movements in the Gulf of Maine Using Archival Tags

J. Kohl Kanwit[1*], Trisha DeGraaf[2] and Christopher Bartlett[3]
[1]Maine Department of Marine Resources, West Boothbay Harbor, ME, [2]Maine Department of Marine Resources, Hallowell, ME, [3]Maine Sea Grant/University of Maine Cooperative Extension, Eastport, ME

10:00 a.m. **Break/Coffee/Refreshments**

Session VI
Mark Dixon, Chair
NOAA's National Marine Fisheries Service
Northeast Fisheries Science Center
Milford, CT

10:20 a.m. The Use of Egg Staging to Define Spatial and Temporal Trends of Early Life Stage Winter Flounder Habitat Use in New York/New Jersey Harbor

Catherine Mulvey[1*], Jenine Gallo[1], Ann Marie DiLorenzo[1], David Davis[2], Paul Moccio[2], and Douglas Clarke[3]
[1]US Army Corps of Engineers-New York District, New York, NY, [2]Henningson, Durham and Richardson Engineering, Pearl River, NY, [3]US Army Engineer Research and Development Center, Vicksburg, MS

10:40 a.m. Twenty-two Years of Juvenile Flatfish in Narragansett Bay: Evaluation of Distribution, Abundance, Trends and Habitat of Juvenile Winter Flounder (*Pseudopleuronectes americanus*), Summer Flounder (*Paralichthys dentatus*), Windowpane (*Scopthalmus aquosus*), and Smallmouth Flounder (*Eutropus microstomus*) from the Narragansett Bay Juvenile Finfish Survey 1988 – 2010

J. Christopher Powell *(retired) and Jason McNamee
Rhode Island Division of Fish and Wildlife-Marine Fisheries, Jamestown, RI

11:00 a.m. Going Digital: The Establishment and Application of a Digital Reference Collection for Atlantic Halibut (*Hippoglossus hippoglossus*) Otoliths

Trisha De Graaf[1*], Amanda Harden[2] and Betsy Grannis[3]
[1]Maine Department of Marine Resources, Hallowell, ME, [2]Unity College, Unity, ME, [3]Maine Department of Marine Resources, West Boothbay Harbor, ME

11:20 a.m. A Partial Recruitment History of Juvenile *Pseudopleuronectes americanus* in the Norwalk River Estuary From 1991 to the Present
Richard Harris, Gabe Rosen, Ali Luciani, Matt Luciani, Ian Kiefer, Amy Fleitz, Alex Sullivan, and Maddy von Zon Vleat
` *Earthplace, Westport, CT*

11:40 a.m. Estimating Summer Flounder Mortality Rates Based on Mark-Recapture Data from a Recreational Angler Tagging Program
Mark Henderson*, Mary Fabrizio and Jon Lucy
Virginia Institute of Marine Science, Gloucester Point, VA

12:00 p.m. **Hosted Buffet Lunch**

Session VII
Anthony Calabrese, Chair (retired)
NOAA's National Marine Fisheries Service
Northeast Fisheries Science Center
Milford, CT

1:00 p.m. Application of the Auto-diametric Method of Estimating Fecundity to Winter Flounder, *Pseudopleuronectes americanus*
Dave McElroy[*], Yvonna Rowinski, Mark Wuenschel, and Richard McBride
NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole Laboratory, Woods Hole, MA

1:20 p.m. Development of 11 Microsatellite Primer Sets for Use in Exploring Gene Flow and Population Structure in Yellowtail Flounder (*Limanda ferruginea*)
Jonathan Breton[1*], Robert Drew, Richard McBride[2], and Ken Oliveira[1]
[1]*University of Massachusetts Dartmouth, Department of Biology, North Dartmouth, MA,* [2]*NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole Laboratory, Woods Hole, MA*

1:40 p.m. Vestibular Asymmetry Precedes and is Dissociated from Eye Translocation during Flatfish (Bamboo sole, *Heteromycteris japonicus,* and Southern Flounder, *Paralichthys lethostigma*) Metamorphosis
Alex Schreiber[1*], Kriscinda Meadows[2], Isabella Bruno[1], and Tadehisa Seikai[3]
[1]*St. Lawrence University, Biology Department, Canton, NY,* [2]*Gettysburg College, Biology Department, Gettysburg, PA,* [3]*Fukui Prefectural University, Department of Marine Bioscience, Obama, Fukui, Japan*

2:00 p.m. Flatfish Recruitment to a Georgia Estuary
Austin Francis
Armstrong Atlantic State University, Savannah GA

2:20 p.m. **Adjourn Meeting**

Poster Session
Salon C
Wednesday December 2nd, 6:00 p.m.

Deborah Pacileo, Chair
Connecticut Department of Environmental Protection
Marine Fisheries Division
Old Lyme, CT

Mercury and Selenium Relationships in Liver, Brain, and Muscle Tissue of Fish
Nichole Ares* and David Taylor
Roger Williams University, Bristol RI

Evaluation of Bioelectrical Impedance Analysis to Predict Condition and Muscle and Liver Energy Content of Three Flatfishes: Winter, Yellowtail and Summer Flounder
Andrew Arruda[1*], Ken Oliveira[1], Mark Wuenschel[2], Dave McElroy[2], and Richard McBride[2]
[1]University of Massachusetts Dartmouth, Department of Biology, North Dartmouth, MA, [2]NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole Laboratory, Woods Hole, MA

Estimation of Fecundity and Development of a Preliminary Fecundity Curve for Georges Bank Yellowtail Flounder (*Limanda ferruginea*)
Jonathan Breton[1*], Richard McBride[2], Mark Wuenschel[2], Courtney Donovan[1], and Ken Oliveira[1]
[1]University of Massachusetts Dartmouth, Department of Biology, North Dartmouth, MA, [2]NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole Laboratory, Woods Hole, MA

Age Verification of Older Yellowtail Flounder from a Tagging Study
Sarah Emery[1]*, Sam Matulich[2], and Larry Alade[1]
[1]NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole Laboratory, Woods Hole, MA, [2]Humboldt State University, Department of Biological Sciences, Arcata, CA

Mortality, Growth, and Condition of Young-of-the-Year Winter Flounder in Long Island Bays

Lyndie Hice[1], Anne McElroy[1], Mark Fast[1, 2], and Michael Frisk[1]
[1]Stony Brook University, School of Marine and Atmospheric Sciences, Stony Brook, NY
[2]Atlantic Veterinary College, University of Prince Edward Island, Department of Pathology and Microbiology, Charlottetown, PEI, Canada

Characterization of Fillet Bruising Patterns in Commercially Harvested Yellowtail Flounder (*Limanda ferruginea*)

Jessica Kenney
Memorial University of Newfoundland, St. John's, NL Canada

Seasonal Use of a Shallow Estuarine Creek by Flatfishes

Robert Kiser* and Mary Carla Curran
Savannah State University, Marine Sciences Program, Department of Natural Sciences, Savannah, GA

Macroscopic and Microscopic Investigations of the Reproductive Organs in Dab *Limanda limanda*

Laura Langan
Commercial Fisheries Research Group, Marine and Freshwater Research Centre, Galway Mayo Institute of Technology, Galway, Ireland

Temporal-spatial Patterns of Tagged Summer Flounder (*Paralichthys dentatus*) in Virginia Waters and Migration to Mid-Atlantic Waters (2007-2010)

Jon Lucy[1*] and Lewis Gillingham[2]
[1]Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, VA, [2]Virginia Saltwater Fishing Tournament, Virginia Marine Resources Commission, Virginia Beach, VA

Beyond '*Flatland*': A Multi-dimensional Approach to Classify Female Winter Flounder (*Pseudopleuronectes americanus*) Maturity and Reproductive Seasonality

Richard McBride[1*], Mark Wuenschel[1], Dave McElroy[1], Yvonna Rowinski[1], and Jeremy King[2]
[1]NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole Laboratory, Woods Hole, MA, [2]Massachusetts Division of Marine Fisheries, New Bedford, MA

Abundance and Density of the Winter Flounder (*Pseudopleuronectes americanus*) in Cedar Island Marina, Clinton Harbor Connecticut

Beth Patrizzi* and Michael Gilman
Cedar Island Marina Research Laboratory, Clinton, CT

Measures of Immune System Status in Young of the Year Winter Flounder from Long Island Coastal Bays
Jaime Romany[1], Mark Fast[1, 2], and Anne McElroy[1*]
[1]Stony Brook University, School of Marine and Atmospheric Sciences, Stony Brook, NY, [2]Atlantic Veterinary College, Department of Pathology and Microbiology, University of Prince Edward Island, Charlottetown, PEI, Canada

A Histological Atlas of Female Winter Flounder (*Pseudopleuronectes americanus*) Oogenesis
Yvonna Rowinski[*], Richard McBride, Mark Wuenschel, and Dave McElroy
NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole Laboratory, Woods Hole, MA

Growth and Maturation of Winter Flounder along the Coasts of Maine and New Hampshire
Sally Sherman* and Keri Stepanek
Maine Department of Marine Resources, West Boothbay Harbor, ME

The Seasonal and Spatial Variability of Flatfish Feeding Habits on the Northeast US Continental Shelf: Preliminary Insights from Cooperative Research
Brian Smith, Joshua Dayton*, David McElroy, Emilee Towle, and Richard McBride
NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole Laboratory, Woods Hole, MA

Behavioral Interactions between Flatfish and Commercial Ground Gear on the Newfoundland Grand Bank
Melanie Underwood*, Paul Winger, George Legge, and Stephen Walsh
Fisheries and Marine Institute of Memorial University, St. John's, NL Canada

An Examination of Winter Flounder (*Pseudopleuronectes americanus*) Decline in Three Western Long Island Bays
Josh Zacharias, Lyndie Hice, and Michael Frisk
Stony Brook University, School of Marine and Atmospheric Sciences, Stony Brook, NY

Abstracts

Oral Presentations

Seasonal Patterns in Body Condition and Proximate Composition for Three Flatfishes: Winter, Yellowtail and Summer Flounder

Mark Wuenschel[*], Dave McElroy, and Richard McBride

NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center
Woods Hole Laboratory, 166 Water Street, Woods Hole, MA 02543

Email: mark.wuenschel@noaa.gov

Seasonal variation in body and reproductive condition and proximate composition and energy content of liver and muscle were evaluated for winter, yellowtail, and summer flounder. Near-monthly samples were analyzed for Gulf of Maine, Georges Bank and Southern New England stocks of winter and yellowtail flounder, and the single stock of summer flounder. Measurements of fish condition [hepato-somatic index (HSI), relative condition factor (K_n) and the proximate composition of muscle and liver tissue] and reproductive condition [gonado-somatic index (GSI)] were determined to evaluate seasonal changes in energy accumulation and depletion and reproduction through an annual cycle. In general, males and females had similar patterns in body and reproductive condition, although the magnitude of change was usually greater for females. Species and stock-specific peaks in GSI were coincident with their respective spawning seasons, with winter and yellowtail flounder having greater peak GSI than summer flounder. Winter and yellowtail flounder gonads began developing in fall, many months in advance of winter-spring spawning. Lower muscle percentage dry weight and energy content in the period leading up to, during and just following spawning were evident in both winter and yellowtail flounder, indicating depletion of muscle energy for reproduction in these species with group synchronous oocyte development. In contrast, summer flounder muscle percent dry weight and energy content was less variable and gonads developed more rapidly leading up to fall-winter spawning, but did show variation in liver energy. Summer flounder have asynchronous oocyte development, spreading the energetic investment into multiple batches of eggs (over a longer period), utilizing energy stored in the liver without sacrificing muscle energy. Tissue specific patterns in energy storage and depletion are discussed in relation to feeding and life history characteristics for these three species.

Spawning Survey of Southern and Gulf Flounder (*Paralichthys lethostigma* and *P. albigutta*) using Scuba Off the South Carolina Coast

Charles R. Tucker

College of Charleston, Department of Biology, Grice Marine Laboratory
205 Fort Johnson Road, Charleston, SC 29412

Email: chuktuk@gmail.com

The southern flounder (*Paralichthys lethostigma*) and gulf flounder (*P. albigutta*) both support important fisheries in South Carolina. Previous studies have shown that southern flounder migrate from inshore estuaries to deeper waters offshore to spawn in fall as the temperature drops. The locations of these spawning grounds, however, are currently unknown. The gulf flounder resides in high salinity waters offshore year-round. While much is known about the life history of these flounder, little is known about the location of spawning grounds or reproduction in the wild. South Carolina Department of Natural Resources divers and recreational divers collected flounder using scuba and spears during 2007-2010. Combined, 85 southern flounder and 218 gulf flounder were collected. Early developing southern flounder were collected just prior to the spawning season. No spawning southern flounder were collected, and only 1 spent female was collected in April. Preliminary evidence suggests that southern flounder may spawn deeper than the recreational limits of scuba (>40 m). Gulf flounder were found spawning at many of the same artificial reefs they inhabit year-round. Early gonad development (vitellogenesis) began in late September or early October. Hydrated oocytes indicating ripe individuals were observed in January, February, and March. The spawning periodicity was 1 spawn every 3 days on average for individual females. Spent individuals were found in March and atretic oocytes had mostly reabsorbed by May indicating the cessation of spawning. Scuba appears to be an effective method for surveying spawning gulf flounder but much less effective for surveying spawning southern flounder.

Potential Effects of Changing Winter Climate on Suitability of Summer Flounder Spawning Grounds in the Mid-Atlantic Bight

John P. Manderson[1*], Linda L. Stehlik[1], Donglai Gong[2], Josh Kohut[2], and Beth Phelan[1]

[1]*NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center James J. Howard Marine Laboratory, 74 Magruder Road, Highlands, NJ 07731*

[2]*Rutgers University, Institute of Marine and Coastal Sciences 71 Dudley Road, New Brunswick, NJ 08901*

Email: john.manderson@noaa.gov

Analyses of NEFSC (Northeast Fisheries Science Center) bottom trawl surveys indicate that the biomass weighted center of summer flounder distribution during autumn migration and spawning shifted Northeast in the Mid-Atlantic bight from 1990 to 2006 at ~12 km y^{-1}. This shift was concurrent with regional warming and rebuilding of the spawning stock following implementation of a 1988 fisheries management plan. The observed change in distribution may have resulted from diminished fishing pressure combined with changes in fall migration patterns with the warming trend. Alternatively these changes could have been produced by increased survival of eggs and larvae transported from continental shelf spawning grounds to estuarine nurseries in the northern part of the species range. We developed this alterative hypothesis by coupling a generalized additive spawning habitat model with a simple egg and larval transport model based on particle tracking of HF radar measured surface currents. Adaptive plankton sampling off the Hudson-Raritan estuary supports our simple coupled model which demonstrates significant numbers of eggs and larvae can be transported from a spawning ground off Long Island Sound along Long Island's south shore toward the Hudson-Raritan Estuary. Analysis of recent estuarine temperatures and Malloy and Target's (1991) study of temperature effects on juveniles both indicate that the survival of progeny transported along this pathway could have increased with winter warming. Increases in the coupling of ontogenic habitats in the northern part of the species range or climate induced shifts in adult migration could have very different effects on important components of the Mid-Atlantic Bight ecosystem.

Distribution and Abundance of Winter Flounder in The Great South Channel

Greg DeCelles*, Sally Roman, David Martins, Anthony Wood, and Steve Cadrin

University of Massachusetts Dartmouth, School for Marine Science and Technology
200 Mill Road, Fairhaven, MA 02719

Email: gdecelles@umassd.edu

We are collaborating with members of the New Bedford otter trawl fleet to conduct an industry-based survey of winter flounder in the Great South Channel. The goal of the survey is to improve the information available to manage and assess the Southern New England/Mid-Atlantic stock of winter flounder, at a time when fishery dependent data sources are limited for this resource. A total of five, ten-day cruises are being completed, with one survey conducted each month between June and October of 2010. After several meetings with the local fishing fleet, a study area was defined based on areas of current and historical winter flounder abundance.

The industry-based survey is comprised of two parts; a biological survey and a mark-recapture experiment. The goal of the survey component is to examine the geographic distribution and biological characteristics of winter flounder in the study area. Demographic information collected during this phase of the survey will improve the data available for the assessment of this resource. Abundance and distribution of flounder in the region is being examined in relation to environmental factors, such as depth, temperature and time of day. Archived samples will be obtained to assess growth and maturity for this stock, and stock composition analysis is planned using meristics, as well as scale and otolith morphometry.

A robust mark-recapture model is being used to estimate the absolute abundance and survival rates of winter flounder in this area. While numerous tagging studies have been conducted for winter flounder, relatively few flounder have been tagged in the Great South Channel. Long term tag recaptures from the commercial fishery provide new insights into the migration patterns of winter flounder, and improve our understanding of the stock dynamics for this species.

Session I *9:40 a.m.*

Does Temperature Play a Role in Long-term Patterns? Use of an Intertidal Salt Marsh Basin by Flatfishes in South Carolina

Mary Carla Curran[1*], Andrew R. Solow[2], and Dennis M. Allen[3]

[1]Savannah State University, Marine Science Program
Department of Natural Sciences, Savannah, GA 31404

[2]Woods Hole Oceanographic Institution, Marine Policy Center, Woods Hole, MA 02543

[3]University of South Carolina,
The Belle W. Baruch Institute for Marine and Coastal Sciences
Georgetown, SC 29440

Email: currranc@savannahstate.edu

We assessed patterns of flatfish habitat use and its relationship with environmental conditions over a 19 year period using the same gear type. Flatfishes were collected from an intertidal salt marsh basin in North Inlet estuary, South Carolina using a bag seine during low tide. Semi-monthly samples from 1984 to 2002 yielded six species of flatfishes that were mostly juveniles. Blackcheek tonguefish *Symphurus plagiusa* were most abundant and experienced a significant long-term increase in numbers correlated with an increase in water temperature. There was also a significant effect of cumulative temperature on first sighting of individuals (p=0.047). The second-most abundant species, the southern flounder *Paralichthys lethostigma*, experienced no significant change in number over the course of the study; however, there was an effect of cumulative temperature on first sighting of individuals (p=0.041). The bay whiff *Citharichthys spilopterus* was the third-most abundant species and had high annual variability with no overall trend over time or with temperature. No long-term pattern was found for the summer flounder *Paralichthys dentatus*. Overall, multiple species used the intertidal habitat during the warmest months, and although arrival times generally coincided, abundance was not always correlated with increases in temperature. This suggests that independent factors affected recruitment to the estuary.

Case Studies in Flatfish Stock Enhancement: Evaluating the Impact of Acclimation Cage Conditioning for Japanese Flounder, *Paralichthys olivaceus*, in Wakasa Bay, Japan

Michelle L. Walsh[1, 2*], Hiroshi Fujimoto[3], Takeo Yamamoto[3], Tatsuya Yamada[3], Youiti Takahashi[3], and Yoh Yamashita[2]

[1]*University of New Hampshire, Department of Biological Sciences, Durham, NH 03824*

[2]*Kyoto University, Graduate School of Agriculture, Maizuru Fisheries Research Station Maizuru, Kyoto, Japan*

[3]*National Center for Stock Enhancement, Fisheries Research Agency Obama Station, Fukui, Japan*

Email: michelle.walsh@unh.edu

Japan is the most active country worldwide with respect to flatfish stock enhancement both in the range of species and number of fish released. In Japan, Japanese flounder, or hirame *Paralichthys olivaceus*, is the primary species represented in annual flatfish catch; thus, hirame has been a paramount choice for both aquaculture and stock enhancement for decades, and is, in fact, the most important stocked marine finfish in Japan. A total of approximately 25 million Japanese flounder are released yearly from federal, prefectural (state), local and private hatcheries throughout the country.

Conditioning fish to the natural environment before release may increase successful recruitment to the fishery, as fish trained for "wild" conditions may transition more easily and successfully upon release. Since 2008, Obama Station, National Center for Stock Enhancement, has conducted pre-release, experimental acclimation cage conditioning for Japanese flounder (N = 10,000-40,000) in both the Takahama and Obama portions of Wakasa Bay, Japan. Recaptured fish were acquired through a cooperative effort between researchers and local fishermen (both commercial and recreational). To date, more conditioned fish have been recaptured via fishermen's catch than unconditioned fish. Initial observations suggest that non-feeding individuals recollected near the release sites may be weaker and more likely to be caught by small boat beam trawl (towing speed 1-1.5 knots) than actively feeding, translocating fish. Thus, higher speed shrimp trawlers deeper in the bay (towing speed 3-3.5 knots) and set/fyke nets set kilometers away from the release sites may be better, non-biased indicators of fitness and intermediate stocking success.

Effect of Mesh Size, Shape, and Codend Attachments on Size Selectivity of Four Species of Flounder in Gulf of Maine Groundfish Trawls

Pingguo He

University of Massachusetts Dartmouth
School for Marine Science and Technology
Department of Fisheries Oceanography
706 South Rodney French Boulevard, New Bedford, MA 02744

Email: phe@umassd.edu

Size selection properties of six codend types were evaluated for four flounder species using the covered codend method. The codends tested were 152, 165 and 178 mm diamond mesh codends, and 165 and 178 mm square mesh codends, and one 165 knotless square mesh codend. All these codends were tested without the chaffing gear which Gulf of Maine groundfish trawlers often use. To evaluate the effect of the chaffing gear on size selectivity, the 165 mm standard diamond mesh codend was also tested when fitted with a typical chaffing gear. A new hydrodynamic codend cover, which was expanded by 12 water-borne kites made of canvas, was developed, tested and used during the codend mesh selectivity studies. This paper describes results for four species of flounder – American plaice (*Hippoglossoides platessoides*), yellowtail flounder (*Limanda ferruginea*), witch flounder (*Glyptocephalus cynoglossus*) and winter flounder (*Pseudopleuronectes americanus*). The results indicated that larger codend mesh sizes retained larger fish for all flounder species using both diamond and square mesh codends. The use of square mesh codends resulted in significantly smaller 50% retention lengths (L_{50}) for flounder ($P < 0.001$) compared with diamond mesh of the same mesh size. The knotless square mesh codend had larger L_{50} than regular knotted square mesh of the same mesh size for all four species of flounder. Use of chaffing gear, however, had no significant effect on the size selection property of the codend for the three species for which data were obtained. The results will be compared with that for roundfish, and discussed with regard to their implication in capture and management of the groundfish resource.

This field experiment was carried out while the author was working at the University of New Hampshire.

Spawning Movements and Habitat Use of Winter Flounder in the Southern Gulf of Maine

Elizabeth A. Fairchild

University of New Hampshire, Department of Biological Sciences, Durham, NH 03824

Email: elizabeth.fairchild@unh.edu

To study the spawning movements and habitat use of adult winter flounder in the southern Gulf of Maine, pre-spawning adults were acoustically tagged offshore and tracked in 2009. In addition, tows were made in the offshore study area to quantify how their reproductive status changed over time.

Peak spawning of winter flounder in Ipswich Bay occurred in late April to early May. Only six fish (15%) were detected entering estuaries between the end of April and August indicating that the majority of the tagged fish did not spawn in estuaries but remained in deeper, coastal waters. Surveys made within the Hampton-Seabrook Estuary (NH) during the period when one tagged female was present (May-June) showed that all adults present had already spawned and were actively feeding.

Nocturnal activity was observed for tagged winter flounder; most horizontal movements (migration) occurred at night. Vertical ascents off-bottom were associated with both nocturnal periods and horizontal migrations. Flounder often rose significantly in the water column (as much as 45 m above the sea floor) during nocturnal migratory movements; it is likely that these migrations were facilitated by selective tidal transport. As of August 2010, conventional tagging returns (336 fish tagged offshore, 6% return rate) show both long and short movements. Fish have been recaptured approximately 2 to 57 km from their tagging sites in depths of 6 to 75 m. Days at liberty range from 33 to 453 days, with an average of 150 days. Spawning site fidelity is evident from interannual recaptures of tagged winter flounder.

Interfacing Systematics and Fisheries Biology: A New Zealand Example (Rhombosoleidae: *Peltorhamphus novaezeelandiae*)

Thomas A. Munroe

NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center
National Systematics Laboratory, Smithsonian Institution, PO 37012
NHB WC 57 MRC-153, Washington, DC 20013-7012

Email: munroet@si.edu

Taxonomic and biological information was recently updated for New Zealand flatfishes, including species in the rhombosoleid genus *Peltoramphus*, most of whose species are endemic to shallow, continental shelf waters of New Zealand. Until this study, *Peltoramphus* was thought to consist only of *P. novaezeelandiae*, *P. latus* and *P. tenuis*. Of these, only *P. novaezeelandiae* (New Zealand sole) grows large enough to have commercial importance. Little is known regarding the biology, ecology and population dynamics of *P. novaezeelandiae*, and almost no such research has been conducted on any of its congeners. In this study, 203 lots, representing 1106 specimens of *Peltorhamphus*, were examined. Of 203 lots studied, 81, representing approximately 40% of the total examined, contained mis-identified specimens. Additionally, an undescribed species, often mis-identified as juvenile *P. novaezeelandiae* or as adult and juvenile *P. latus*, was discovered among specimens examined. Discovery of an undescribed species and the large number of mis-identified specimens required a taxonomic re-evaluation of all members of the genus. Mis-identifications of juvenile specimens of *Peltorhamphus* and the presence of a previously unrecognized fourth species from this region confound our understanding of distributions, abundances and population dynamics for these fishes, especially the commercially important *P. novaezeelandiae*. Correct identification of specimens is the first and most critical step required in attaining meaningful (accurate) life history and distributional data for these species. Better taxonomic resolution within *Peltoramphus* should facilitate data capture necessary for estimates of abundance, distribution, life history parameters and population dynamics of *P. novaezeelandiae* and its congeners. Only then can the commercially important species be managed effectively.

30 Years on the Niantic River: Looking Back at Millstone Winter Flounder Studies

Donald J. Danila

Dominion Resources Services
Millstone Environmental Laboratory
PO Box 128, Waterford, CT 06385

Email: donald.j.danila@dom.com

Since the mid-1970s, winter flounder have been studied in the Niantic River estuary and nearby waters of Niantic Bay and Long Island Sound as part of ecological studies required by first the US Nuclear Regulatory Commission and then the Connecticut Department of Environmental Protection in connection with the construction and operation of Millstone Power Station (MPS) in Waterford, CT. Over this 35-year period, winter flounder abundance has decreased considerably, stimulating efforts to understand its population dynamics and apparent causes for the decline, including potential impacts from MPS operation. The value of the MPS winter flounder sampling programs is related to their consistency over long time periods and a multi-faceted approach, which includes sampling of larvae, juveniles, and adults. These studies have ranged from intensive work occurring each year over a relatively short time period, such as annual Niantic River adult spawning stock abundance surveys, to lesser, but continuous sampling efforts, such as winter flounder abundance as determined by trawl monitoring at three stations that have been sampled every other week since June of 1976. Through the years, numerous special studies were carried out that have led to additional insights on winter flounder biology. Some of these studies were collaborative efforts with other researchers in Southern New England. Results of note include estimating abundance of adults spawning in the Niantic River; movements of adults; winter flounder genetic stock structure in eastern Long Island Sound; larval and juvenile processes, including movements, development, growth, and mortality; and environmental and operational impacts to this species affecting abundance. Key findings are briefly summarized.

Using Winter Flounder Otoliths to Evaluate Habitat Quality and Test the Feasibility of Stock Discrimination and Movement Patterns between George's Bank and SNE/MAB Stocks using Laser Ablation and Synchrotron X-ray Fluorescence

George W. Jackman[1*], Karin E. Limburg[2], and John Waldman[3]

[1]*City University of New York, Graduate Center*
365 Fifth Avenue, New York, NY 10016

[2]*State University of New York, College of Environmental Science and Forestry*
1 Forestry Drive, Syracuse, NY 13210

[3]*City University of New York, Queens College*
Department of Biology, 65-30 Kissena Blvd, Flushing, NY 11367

Email: geojackman@gmail.com

The winter flounder is a demersal flatfish that is intimately associated with its environment through both the sediments and the water column. Using tissue trace metal analysis and otolith microchemistry, our methods are showing strong potential to use winter flounder (*Pseudopleuronectes americanus*) as an environmental sentinel registering habitat quality through chemical exposure patterns absorbed in their otoliths. We used a combination of trace elements to determine levels of contaminants from various water bodies to ascertain the temporal stability and spatial heterogeneity of site specific signatures, and used synchrotron-based X-ray fluorescence microscopy and laser ablation inductively coupled mass spectrometry to quantify trace elements in winter flounder otoliths. From our preliminary results, it appears that winter flounder otoliths from the lower Hudson River Estuary/western Long Island Sound complex are absorbing high levels of metal contaminants introduced from anthropogenic sources as well as through natural processes (migration). Once these signatures have been established and developed, patterns of chemical uptake can be utilized to reconstruct life history patterns, track fish movement, and discriminate between stocks of fish. We will also analyze winter flounder otoliths from a clean site, George's Bank, to test the feasibility of discriminating between stocks of winter flounder and movement between regions using otolith microchemistry.

Application of Reflex Action Mortality Predictors to Estimate Discard Mortality of Yellowtail Flounder

Adam Barkley* and Steve Cadrin

University Of Massachusetts Dartmouth, School for Marine Science and Technology
200 Mill Road, Suite 325, Fairhaven, MA 02719

Email: u_abarkley@umassd.edu

Survival rate of discarded fish is unknown for many fisheries, posing a large source of uncertainty in stock assessment and fisheries management. The trawl fishery in Southern New England has substantial bycatch and discards of yellowtail flounder. Reflex Action Mortality Predictors (RAMP) provides a potential tool to address the difficult task of estimating discard mortality. A suite of reflex actions (e.g., resistance, mouth closure, operculum closure, etc.) were measured in the laboratory for stressed and unstressed fish and related to mortality. Factors influencing RAMP and mortality (e.g., tow duration, duration of air exposure) were tested using controlled experimental tows. RAMP data were also collected during normal fishing operations in Southern New England to provide preliminary estimates of discard mortality and to design more representative sampling protocols. Logistic regression was used to model the relationship between reflex impairment scores and long term mortality. Experimental results indicate a significantly increasing relationship between lab-based reflex impairment and mortality. Measuring RAMP variables from discarded fish in the field can be used to estimate representative discard mortality rates from the fisheries.

Where Have All the Winter Flounder (*Pseudopleuronectes americanus*) Gone?

Timothy C. Visel

The Sound School Regional Vocational Aquaculture Center
17 Sea Street, New Haven, CT 06519

Email: tim.visel@new-haven.k12.ct.us

Winter flounder like diverse habitats including those containing shell, vegetation, sand and muddy bottoms. Each provides the means for different feeding opportunities. Shellfish beds inhabited by mussels, clams and oysters have been historically associated with winter flounder populations.

During the 1960's and 1970's, winter flounder fishermen would see these inshore shellfish areas closed to shell fishing and as a result start to fill in or silt over. Mackenzie (1970) showed that oyster beds deprived of harvest energy lose 50% reproductive capacity in two years, and within four years 90% reproductive capacity is lost. Some oyster areas have been closed and uncultivated for decades. As shellfish habitat quality declined, so did the flounder habitat. In some areas, we speeded that decline with excess organics, nutrients and energy reduction.

Fishermen in the 1980's also noticed flounder fin rot disease in these organic and nutrient enriched soft bottom muck areas. At night these bottoms often contained little or no oxygen as sediment respiration consumed much of the oxygen while breaking down excess plant material. As a consequence of reduced oxygen levels, flounder exited these critical habitat areas. The seafloor often produced the rotten egg odor of hydrogen sulfide, a sign that respiration in the sediments had gone anaerobic and become hostile to many finfish and shellfish species.

After a century of flounder habitat questions, we may finally have the answers to "where have all the winter flounder gone?!"

Movement of Summer Flounder (*Paralicthys dentatus*) in Relation to Hypoxia in an Estuarine Tributary

Margaret H. Miller* and Timothy E. Targett

University of Delaware, School of Marine Science and Policy
700 Pilottown Road, Lewes, DE 19958

Email: mhmiller@udel.edu

We examined the effects of hypoxia on movement of juvenile and adult summer flounder (*Paralicthys dentatus*). Summer flounder were captured from Indian River Bay, Delaware, surgically implanted with Vemco V7-4L acoustic tags, and released into Pepper Creek, a tributary of Indian River Bay that experiences diel-cycling hypoxia. Overall, 17 juveniles and 8 adult summer flounder were released into Pepper Creek during September 2007 and 2008, and July 2009. Vemco VR2 acoustic receivers and YSI 600XLM multi-parameter sondes were deployed along the longitudinal axis of Pepper Creek to capture the spatial and temporal dynamics of summer flounder movement in relation to hypoxia. Individual fish tracks were plotted on spatiotemporal DO contour plots using MATLAB software and analyzed using binary logistic regression with respect to the following environmental variables: spatial and temporal patterns of DO and temperature, tide, and insolation, to determine how environmental conditions (hypoxia in particular) predicted movement behavior. Results show that summer flounder remained relatively sedentary when DO concentrations were > 4.8 mg O_2/L, but responded actively to growth-reducing (DO ≤ 4.8 mg O_2/L) and potentially-lethal (≤ 2.3 mg O_2/L) DO concentrations, with the details of activity driven by the specific nature of the DO environment. Residency time in the tributary was shorter for fish released into unhealthy DO concentrations as oppose to fish released in DO > 4.8 mg O_2/L; the same was true for duration of exposure to unhealthy DO levels. With respect to movement, the temperature variables significantly predicted overall activity whereas the spatial DO gradient and tidal flow discriminated between upstream and downstream movement. Additionally, tidal flow occasionally inhibited escape from hypoxic areas for smaller summer flounder. Given the relatively low DO concentrations that elicit movements, summer flounder in Pepper Creek are experiencing DO levels that inhibit growth and can result in mortality.

Session III *2:20 p.m.*

Elucidating the Early Life History of *Pleuronectes platessa* in the Northern Irish Sea Using Otolith Microstructural Analysis

Melanie Zölck

Galway-Mayo Institute of Technology, Marine and Freshwater Research Centre
Commercial Fisheries Research Group, Department of Life Science
Dublin Road, Galway, Ireland

Email: mzoelck@mail.infocanarias.com

Plaice are an important commercial species in Europe. While nursery grounds are well studied in the eastern Irish Sea, little is known about the species early life history in the western Irish Sea or western Scotland. Evidence suggests that separate stocks may occur in these areas. Elucidation of migration patterns, spawning sites and population structure is paramount for fisheries management. In fish otoliths, material is deposited incrementally on a daily basis, allowing the reconstruction of life histories and age estimation via microstructural analysis. The microstructure of 160 plaice otoliths from the nursery grounds on the west of Scotland, the east Coast of Ireland and Galway Bay was analyzed. The data obtained were used to conduct a comparative study of life history parameters such as larval duration, growth rate and settlement dates between these locations.

Differences in growth rate, settlement timing and larval duration are useful markers for the differentiation of separate stocks present in the study area. These differences have not been examined in a comparative manner in the regions under consideration, or on such a large geographical scale. This substantially increases our knowledge of plaice life history dynamics and stock structure in the region.

This work will feed into future dispersal models to identify sources of settlers, contributing to a large-scale geographical comparison of early life history across Europe. This will improve current understanding of environmental influences on parameters like larval duration, and impacts of environmental change on nursery ground delivery.

Session III *2:40 p.m.*

Transport and Fate of Winter Flounder Eggs in Highly Modified Port and Harbor Settings

Douglas Clarke[1*], Tahirih Lackey[2], Jarrell Smith[2], and Sung-Chan Kim[2]

[1]Environmental Laboratory, [2]Coastal and Hydraulics Laboratory
US Army Engineer Research and Development Center, Vicksburg, MS 39180

Email: douglas.clarke@erdc.usace.army.mil

Over the past century, winter flounder (*Pseudopleuronectes americanus*) spawning habitat in the Northeast has been fragmented by development of navigation infrastructure. Protection of remaining habitat for depleted stocks has consequently risen in priority among regulatory agencies. Ichthyoplankton sampling has been conducted in NY/NJ Harbor to characterize temporal and spatial distribution of winter flounder eggs and larvae. Additional investigations are designed to develop predictive models for identifying potential spawning habitat and simulating dispersal of winter flounder eggs. These efforts address questions related to Essential Fish Habitat designations for egg stages. Predictive tools provide a capability to estimate exposures of egg stages to sediment re-suspended and re-deposited by harbor dredging. Since winter flounder spawn demersal, adhesive eggs that generally take three weeks to hatch, embryonic stages could be impacted by elevated total suspended sediment concentrations in the water column, or by elevated sedimentation rates. These concerns led to seasonal restrictions on dredging projects near suspected winter flounder spawning habitat. Uncertainty exists with respect to the attributes and location of winter flounder spawning habitat and tolerance to dredging-induced sedimentation. Potential movements of eggs in highly modified harbors add complexity to assessments of impacts.

We have developed predictive tools to simulate transport of sediment re-suspended by dredging operations, and transport of eggs through hatch. A numerical modeling study was conducted using a dredging scenario typical of operations in Newark Bay, NJ to estimate egg exposures to elevated sedimentation rates. This study focused on transport and fate of eggs deposited in suspected spawning habitat near navigation channels that require periodic maintenance. A hydrodynamic model CH3D-WES was used to calculate bottom shear stresses and map depositional environments in potential spawning habitat within the bay and to drive a Particle Tracking Model (PTM). PTM simulates egg transport and dredging-induced sediment re-suspension where eggs were treated as particles and tracked throughout a simulated development period until hatching. Input parameters (egg adhesive and sedimentation properties) were derived from laboratory studies using freshly spawned winter flounder eggs. Studies are underway to relate results of the ichthyoplankton sampling to simulated spatial distributions and transport of egg "particles". Results are discussed with regard to dredging project management pertinent to winter flounder protection.

An Assessment of the Flounder (*Paralichthys spp.)* Gig Fishery in South Carolina

Eric Hiltz*, Brad Floyd, Marcel Reichert, and Julia Byrd

South Carolina Department of Natural Resource, Marine Resources Division
217 Fort Johnson Road, Charleston, SC 29412

Email: hiltze@dnr.sc.gov

A creel survey, two mail surveys, and an aerial survey were performed from November 2006 to August 2009 to examine the behaviors, harvest, and effort of flounder giggers in South Carolina. Flounder giggers were most active between June and September on nights when low tide was between 21:00 and 02:00 EST and wind speeds were less than 5 mph (8 km/hr). Most gigging took place in Georgetown County around North Inlet and Murrells Inlet. Gigging parties harvested a median of 1 to 4 flounder per trip depending on experience, and gigged flounder averaged 414 mm (±2 SE) or 16.3 inches total length. Only two gigged flounder examined during this study were identified as *Paralichthys dentatus*, all others (584) were *P. lethostigma*. Although they accounted for 13.4% of all licensed participants in the South Carolina recreational saltwater fishery, giggers harvested 42% of the total weight of flounder caught recreationally in South Carolina in 2007 and 32% in 2008. Also, 51% of the giggers interviewed started gigging within 5 years of being interviewed, suggesting an increase in the popularity of flounder gigging which could cause the gig fishery to account for an even greater proportion of the recreational flounder harvest in South Carolina. This study indicated that the amount of flounder harvested by giggers in South Carolina is significant, and gigging is gaining popularity. Therefore, it is essential that this understudied portion of the fishery continue to be monitored and taken into account in future flounder stock assessments and management decisions.

Environmental Factors Effecting Coastal Benthic Communities: A Case Study Incorporating Biomarkers, Biofilms and Parasite Prevalence

Laura Langan

Commercial Fisheries Research Group, Marine and Freshwater Research Centre
Galway Mayo Institute of Technology, Dublin Road, Co. Galway, Ireland

Email: laura710@msn.com

In recent years, benthic communities have attracted significant interest mainly as biological indicators, whose strengths lie in the sensitivity they show to environmental change in aquatic ecosystems. Studies have shown that changes in benthic community structure play an important role in pollution assessment models.

The dab, *Limanda limanda,* is considered a sentinel monitoring fish, used in large geographical areas to test for chemical environmental stressors. In this study, the dab will be used to elucidate possible environmental stressors acting on the benthic community of the sampling site, using biomarkers of stress alkali-labile phosphate (ALP), lipid peroxidation (LPO) and glutathione s-transferase (GST), biofilms assemblages and parasite prevalence.

While predictions generated from this studies' hypotheses need to be rigorously tested, the study provides indications of how all benthic community structures act, including those normally not taken into consideration.

The Effects of the Invasive Ascidian *Didemnum vexillum* on the Benthic Macrofauna and Feeding Habits of Winter Flounder (*Pseudopleuronectes americanus*) on Northern Georges Bank

Brian E. Smith[1*], Jeremy S. Collie[2], and Nicole L. Lengyel[2]

[1]*NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center Woods Hole Laboratory, 166 Water Street, Woods Hole, MA 02543*

[2]*University of Rhode Island, Graduate School of Oceanography, Narragansett, RI 02882*

Email: brian.smith@noaa.gov

The presence of the invasive tunicate *Didemnum vexillum* on northern Georges Bank in the Atlantic Ocean was documented in 2002 and concern has grown over its impact on marine benthic communities. In particular, it may be that *D. vexillum* indirectly affects commercially-important fisheries resources (e.g. altering prey abundance). To address these concerns, we quantified the differences in the benthic macroinvertebrate and demersal fish communities between sites with contrasting levels of *D. vexillum* occurrence for the Habitat Area of Particular Concern (HAPC) of Closed Area II on Georges Bank. To address whether second-order effects on fish feeding habits were occurring, we examined fish diets across the *D. vexillum* factor for a well-known benthivore: winter flounder (*Pseudopleuronectes americanus*). Baseline benthic macrofaunal indices: species richness, species abundance (n/L), and species biomass (g/L) were generally greater at sites with *D. vexillum* present; however, an evenness index was higher where the ascidian was absent. Interestingly, significant differences in fish feeding habits were detected and attributed to a *D. vexillum* effect. Winter flounder ate *D. vexillum* in areas where the ascidian was present, although diet dissimilarity between sites was largely explained by other prey (*e.g. Cancer* spp. and Polychaeta) that responded positively to the presence of *D. vexillum* as seen in the benthic macroinvertebrate community.

Session IV *4:20 p.m.*

The Use of Acoustic Telemetry as a Means of Assessing Discard Mortality in the Summer Flounder (*Paralichthys dentatus*) Commercial Fishery: A First Look

Mathew Yergey*, Kenneth W. Able and Thomas M. Grothues

Rutgers University Marine Field Station, Institute of Marine and Coastal Sciences
800 c/o 132 Great Bay Boulevard, Tuckerton, NJ 08087

Email: grothues@marine.rutgers.edu

Approximately 5-10% (242-485 metric tons) of the summer flounder commercial landings were estimated as loss from discards of the otter trawl and scallop dredge fisheries during 2009. These numbers were based on an estimated 80% discard mortality rate. However, measuring discard mortality is complicated, as a variety of potentially compounding fishing related stresses may lead to latent mortality. On-board physiological assessments are inadequate and caging experiments are confounded by cage effects. We are determining baseline behavior of dead, live-release trawl caught fish, and un-trawled fish using acoustic telemetry to develop movement metrics for assessing latent mortality. This method allows observation of individuals as they undergo the exact treatment of a discarded individual without adding unnecessary biases. Preliminary results in an estuary have shown substantial differences in movement between live and dead fish, with dead fish showing greater movement in synchrony with tidal currents. These counter-intuitive results are supported by flume observations that show relatively low current speeds (10-20 cm/sec) are capable of lifting a dead fish off the sediment surface and transporting it. Results from commercial trawling in the ocean in September 2009 yielded an average deck mortality for a standard trawl (3 trawls, mean duration 125.6 min) of 17.8%, but many fish (44.4%) were in “poor” condition, supporting the need for delayed mortality estimates (31.1% in “good” condition, and 6.8% in “excellent” condition). Initial in situ telemetry results are promising; with vertical movement behavior measured from sensored tags contributing an important discriminator.

Winter Flounder Maturation between Stocks and Years: An AIC Analysis of Female Maturity Ogives based on Gonad Histology

Richard McBride*, Mark Wuenschel, and Paul Nitschke

NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center
Woods Hole Laboratory, 166 Water Street, Woods Hole, MA 02543

Email: richard.mcbride@noaa.gov

The form and dynamics of female winter flounder reproductive maturation and annual reproduction were examined to understand the following assumptions: 1) the logistic model satisfactorily explains the change in maturation and non-annual (skipped) spawning with respect to size and age, 2) there are stock-specific differences in skipped spawning and size and age at maturation among US stocks (i.e., Gulf of Maine, Georges Bank, southern New England/ Long Island Sound), and 3) skipped spawning rate and size and age maturation does not change significantly between years or cohorts during a short period. Maturity and reproductive participation (active vs. inactive/skip) were classified based on thin sections of ovary tissue using two staining methods: 1) hematoxylin and eosin stain and 2) Schiffs-Mallory Tricrome. The classification scheme included characteristics of oocytes (most advanced oocyte stage), thickness of the gonad wall, and presence of post-ovulatory follicles. Akaike's Information Criterion (AIC) was used to evaluate the plausibility of these assumptions for female winter flounder.

Examination of Monthly Oocyte Development and Spawning Patterns in Gulf of Maine Winter Flounder, *Pseudopleuronectes americanus*, by Macroscopic and Histological Methodologies

Yvonna Rowinski*, Dave McElroy, Mark Wuenschel, and Richard McBride

NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center
Woods Hole Laboratory, 166 Water Street, Woods Hole, MA 02543

Email: yvonna.rowinski@noaa.gov

In winter flounder, *Pseudopleuronectes americanus,* the development of oocytes from oogonia to final maturation is a dynamic process that takes more than one year. Beginning at maturation, and typically on an annual cycle, hundreds of thousands of active germ cells are produced mitotically and a similar number enter meiosis, which is associated with rapid cell growth, accumulation of yolk and lipids, hydration of oocytes, and ovulation of eggs. To better understand this process, we evaluated monthly samples of winter flounder collected in the Gulf of Maine from cooperative work with the commercial fishery beginning December 2009. Standard macroscopic data were collected from individual fish, and gonad samples were preserved and thin sections of ovary tissue were cut for histology and stained with Schiffs-Mallory Tricrome. Both whole, preserved oocytes and oocytes from histological sections were measured to determine diameter length-frequencies. Oocyte development of mature female fish began by early fall and was completed in early winter. This agreed with the peak in GSI, oocyte diameter-length frequency distributions, and the occurrence of spent individuals by mid-winter. Spawning in the Gulf of Maine winter flounder stock peaked in April and May, with some individuals starting as early as February, then completed by early July. Evidence that mature fish were ramping up in September and spawning by March establish the optimal times to track annual variation in biological traits for this stock, e.g., maturity oogives, fecundity, spawning activity, and skipped spawning. The use of multiple methods, especially microscopic techniques, to analyze oocyte development provides a more detailed characterization of spawning patterns. The monthly sampling interval made possible through cooperative research and the commercial fishing industry has provided important information on the temporal persistence of both macroscopic and microscopic characters used to assess maturity and reproduction. This information will allow us to critically evaluate and refine classification schemes used in ongoing resource surveys occurring at discrete periods each year.

The Winter Flounder Baby Book: A Parody (A 9-minute Film)

Michelle L. Walsh[1, 2] and Stacy C. Farina[1]

[1]*University of New Hampshire, Department of Biological Sciences*
46 College Road, Durham, NH 03824

[2]*Kyoto University, Maizuru Fisheries Research Station*
Nagahama, Maizuru, Kyoto 625-0086 Japan

Email: michelle.walsh@unh.edu

This comical interpretation of the first year-in-the-life of a winter flounder documents larval and juvenile morphological development and feeding activity as well as the more risqué "adult" behaviors of spawning and courtship. True video footage is interspersed with photomontage and reenactment. Wild mating depiction based on laboratory work by Breder (1922) and Stoner et al. (1999), as well as overall flatfish behavioral descriptions detailed in "Flatfishes: Biology and Exploitation" by Robin N. Gibson (2005). An early version of this film was originally constructed for Drs. Jim Haney and Win Watson's graduate BIOFILMS seminar at the University of New Hampshire in 2009.

Session V *8:00 a.m.*

Burial in Winter Flounder (*Pseudopleuronectes americanus*): Understanding Limits to Telemetry Success

Thomas M. Grothues* and Kenneth W. Able

Rutgers University Marine Field Station, Institute of Marine and Coastal Sciences, 800 c/o 132 Great Bay Boulevard, Tuckerton, NJ 08087

Email: grothues@marine.rutgers.edu

Measuring the reliance of adult winter flounder (*Pseudopleuronectes americanus*) on estuarine habitat requires individual-level histories, recently pursued through the use of acoustic telemetry. Approaches include gates of moored receivers to document passage and residence, periodic visitation of a grid of listening stations by a vessel with a hydrophone, vessel-towed and AUV-mounted hydrophone searches, and continuous 3-D tracking through a synchronized multiple-hydrophone positioning array in a small area (> 2 km^2). Efforts in two New Jersey estuaries over four years have been hampered by sporadically poor search returns, most likely owing to burial by the tagged fish. We analyzed the effect of burial on tag signal (68 kHz, 5 s repeat rate) propagation relative to these approaches. Controlled tests of tag burial *in situ* demonstrated a complete signal loss with burial at any depth and severe restriction when the tag was laying on the sediment surface. Water column depth during telemetry positively affected reception from a mobile hydrophone. Signal strength of tags on fish at liberty as recorded by an AUV-mounted hydrophone was truncated on the low end of the expected distribution indicating directional baffling of the signal by benthic features. Meter-scale tracking by multi-hydrophone trilateration over periods of days to weeks was analyzed for periodicity and duration of burial by timeline disruption. Finally, winter flounder held in captivity in ambient temperature flow-through enclosures were observed for depth and periodicity of burial to understand how behavior could affect detection probability. The use of Hidden Markov Models presents an opportunity to correct for biases in tag detection rates due to burial.

Abundance, Growth, and Diet of Juvenile Summer Flounder (*Paralichthys dentatus*) and Winter Flounder (*Pseudopleuronectes americanus*) in Narragansett Bay RI/MA

Carissa L. Gervasi* and David L. Taylor

Roger Williams University, Department of Marine Biology
1 Old Ferry Road, Bristol, RI 02809

Email: cgervasi924@g.rwu.edu

Summer flounder, *Paralichthys dentatus*, and winter flounder, *Pseudopleuronectes americanus,* utilize estuaries as nursery habitat during early life stages. In southern New England estuaries, however, little is known regarding the spatiotemporal overlap and potential biotic interactions between the flounder species. The purpose of this research was to assess the abundance, growth, and dietary habits of age-0 summer and winter flounder to determine if predator-prey and/or competitive relationships exist. During the summers of 2009 and 2010, flounder in the Seekonk and Taunton Rivers (RI/MA) were sampled fortnightly using beach seines. Captured flounder were enumerated, measured for total length, and a sub-sample was preserved for stomach content analysis. Flatfish abundance was higher in the Seekonk River than the Taunton River for both summer and winter flounder in 2009 and 2010, and summer flounder were completely absent from the Taunton River in 2010. Summer flounder grew faster than winter flounder, which may be attributed to differences in dietary habits. Decapods and amphipods comprised the majority of the summer flounder diet, while amphipods, nematodes and copepods were favored by winter flounder. Calculation of the Schoener's Index showed that there was no biologically significant competition between summer and winter flounder. Among the identifiable fish prey in summer flounder stomachs, however, there was evidence of predation on winter flounder, albeit to a limited extent. In order to achieve a better understanding of the diets and trophic positioning of the summer and winter flounder, future work will analyze nitrogen stable isotope signatures of the two species.

Associations between Temperature and Winter Flounder, *Pseudopleuronectes americanus*: Egg and Larval Distributions in New York/New Jersey Harbor

Dara Wilber[1*], Douglas Clarke[2], David Davis[3], Sarah Zappala[3], Catherine Mulvey[4], Ann Marie DiLorenzo[4] and Jenine Gallo[4]

[1]*Bowhead Information Technology Services*
664 Old Plantation Road, Charleston, SC 29412

[2] *US Army Engineer Research and Development Center*
3909 Halls Ferry Road, Vicksburg, MS 39180

[3]*Henningson, Durham and Richardson Engineering, Inc.*
One Blue Hill Plaza, Pearl River, NY 10965

[4]*US Army Corps of Engineers New York District*
26 Federal Plaza, New York, NY 10278

Email: wilberdh@aol.com

Results of an extensive aquatic biological sampling program within New York/New Jersey Harbor (NY/NJ Harbor) can be used to inform dredging management practices. Ichthyoplankton surveys conducted from 2002 to 2010 provide an extensive dataset characterizing the temporal and spatial distributions of winter flounder eggs and larvae. Spatial analyses revealed areas of the Harbor of low (Arthur Kill and Newark Bay) and high (shallow habitat in the Upper and Lower Bays) value as winter flounder spawning habitat. In addition, the distribution of eggs and presence of post-yolk-sac (PYS) larvae were associated with the duration of extreme low water temperatures. For instance, the date by which 90% of PYS larvae were collected was inversely correlated with March minimum water temperatures ($r^2 = 0.65$, $p < 0.05$). Thus, in years with mild winters, 90% of PYS larvae were collected by early May, whereas in colder years this benchmark occurred weeks later. These results are relevant to effective management of dredging activities such that seasonal restrictions protect winter flounder eggs and larvae from dredging impacts while enabling cost effective maintenance of navigation channels.

Multi-decadal Abundance of Hogchokers (Achiridae: *Trinectes maculatus*) in Lower Chesapeake Bay and Its Tributaries

G. Hank Brooks[1*], Thomas Munroe[2], and Troy Tuckey[1]

[1]*College of William and Mary, Department of Fisheries*
Virginia Institute of Marine Science, Gloucester Point, VA 23062

[2]*NOAA's National Marine Fisheries Service, National Systematics Laboratory*
Smithsonian Institution, PO Box 37012, NHB, WC 57, MRC-153
Washington, DC 20013-7012

Email: hbrooks@vims.edu

The hogchoker, a small-sized (to about 210 mm SL) dextral flatfish, is the only member of the family Achiridae occurring in Chesapeake Bay. The hogchoker is a common, ubiquitous, year-round resident species of Chesapeake Bay. Small size and inaccessibility to approved fishing gears allowed within Chesapeake Bay render this species unimportant in the landings of commercial fisheries operating in these waters. Despite their relatively small size compared with other flatfishes occurring in the Bay, hogchokers, nonetheless, are the numerically dominant, and also represent a considerable proportion of the biomass of flatfishes taken in the VIMS demersal trawl survey of juvenile fishes occurring in the Bay. Hogchoker ranks among the top five species collected annually in the bottom trawl survey of the Virginia portion of Chesapeake Bay and its tributaries (1988 – 2009). Since 1988, more than 1,489,000 hogchokers have been captured. The spatial distribution of hogchokers varies with location in Virginia with the James River ranking first with 721,159 individuals captured, followed by the York River (514,850 individuals), the Rappahannock River (217,600 individuals), and lastly the main stem Bay (36,115 individuals). Indices of relative abundance show nearly 100-fold difference among years in the James River, whereas patterns in the remaining sampling areas show less dramatic variation in abundance. Patterns in spatial distribution and abundance will be explored using multivariate models that will include water temperature, salinity, depth, and dissolved oxygen as explanatory variables. Results from this analysis will be used to describe the ecology of this numerically dominant species.

Evaluation of Winter Flounder Larvae in Narragansett Bay, Rhode Island from 2001-2008

Grace Klein-MacPhee*, Eric G. Schneider, and Najih B. Lazar

Rhode Island Department of Environmental Management
Division of Fish and Wildlife-Marine Fisheries, Coastal Fisheries Laboratory
3 Fort Wetherill Rd, Jamestown RI 02835

Email: gracemac1@verizon.net

Winter flounder (*Pseudopleuronectes americanus*) were once an important commercial and recreational species in Rhode Island; however, the Southern New England/Mid-Atlantic stock has been declining since the 1980's, and recent stock estimates are at historic lows. We conducted ichthyoplankton surveys at fifteen stations in Narragansett Bay between 2001 and 2008 to monitor larval abundance of finfish. We tested for seasonal and spatial trends in annual abundance of winter flounder larvae and examined whether larval abundances were correlated with physical parameters, including water temperature and salinity. Winter flounder larvae were the fifth most abundant species over the eight years comprising 9.6% of all larvae collected. They occurred from early February through June with the greatest abundance in March and April. Larvae were present at all stations, but stations in the Providence River, upper Narragansett Bay, and Sakonnet River showed greater abundances compared to stations in the lower Narragansett Bay and the East Passage. Larvae were most abundant in 2003 and least abundant in 2007. We used a Mann-Kendall analysis of trend to determine the relationship between annual abundance and year. This analysis showed a downward trend from 2003 to 2008, which is consistent with other surveys conducted during the same time period in the Providence River (upper Narragansett Bay, RI) and Niantic River (CT).

Investigations into Atlantic Halibut (*Hippoglossus hippoglossus*) Behavior and Movements in the Gulf of Maine Using Archival Tags

J. Kohl Kanwit[1*], Trisha A. C. DeGraaf[2] and Christopher Bartlett[3]

[1]*Maine Department of Marine Resources, PO Box 8, West Boothbay Harbor, ME 04575*

[2]*Maine Department of Marine Resources, 21 State House Station, Hallowell, ME 04333*

[3]*Maine Sea Grant/University of Maine Cooperative Extension*
16 Deep Cove Road, Eastport, ME 04631

Email: kohl.kanwit@maine.gov

Atlantic halibut (*Hippoglossus hippoglossus*) were tagged along the coast of Maine in the Northeastern United States between 2007 and 2009 with two types of electronic archival tags: Pop-up Satellite Archival Tags (PSAT) and Data Storage Tags (DST). Temperature and depth profiles were successfully obtained for twelve fish from a collective sample size of 70 individuals. Fish were released at varying sizes from 51 cm to 173 cm and data were recorded over different time frames from as little as two weeks to a full year. Temperature data showed a range from 2 to 12 degrees Celsius and depth data ranged from 3 to 248 meters. Light data were not successfully recorded by most of the PSATs due to depth and water quality, and therefore provided little geolocation information. Data from the electronic tags reveal a strong temperature preference within season and rapid depth changes contrasted by periods of apparently sedentary behavior. Tags were recovered near their original release locations and to the east in Canadian waters, supporting previous results from conventional tagging projects.

The Use of Egg Staging to Define Spatial and Temporal Trends of Early Life Stage Winter Flounder Habitat Use in New York/New Jersey Harbor

Catherine J. Mulvey[1*], Jenine Gallo[1], Ann Marie DiLorenzo[1], David S. Davis[2], Paul A. Moccio[2], and Douglas G. Clarke[3]

[1]*US Army Corps of Engineers-New York District*
26 Federal Plaza, New York, NY 10278

[2]*Henningson, Durham and Richardson Engineering, Inc.*
One Blue Hill Plaza, Pearl River, NY 10965

[3]*US Army Engineer Research and Development Center*
3909 Halls Ferry Road, Vicksburg, MS 39180

Email: catherine.j.mulvey@usace.army.mil

The New York/New Jersey Harbor estuary is an important habitat complex set within one of the most intensively urbanized corridors in the United States. Biological sampling conducted by the US Army Corps of Engineers and the Port Authority of New York and New Jersey has included the use of an epibenthic sled to sample early life stage winter flounder (*Pseudopleuronectes americanus*). The observed distribution of winter flounder eggs and larvae within the 10-year dataset indicates that this species uses specific areas of the harbor as spawning and nursery habitat. To further define these trends, a sequential staging method was designed based upon winter flounder egg development described by Martin and Drewry (1978). The staging of eggs, conducted for the past three years of the dataset, enables one to better distinguish between eggs recently deposited from those that are more developed and which may have moved from their site of deposition. Program results have been used by resource managers to refine seasonal work restrictions while optimally protecting winter flounder habitat.

Twenty-two Years of Juvenile Flatfish in Narragansett Bay: Evaluation of Distribution, Abundance, Trends and Habitat of Juvenile Winter Flounder (*Pseudopleuronectes americanus*), Summer Flounder (*Paralichthys dentatus*), Windowpane (*Scopthalmus aquosus*), and Smallmouth Flounder (*Eutropus microstomus*) from the Narragansett Bay Juvenile Finfish Survey 1988 – 2010

J. Christopher Powell *(retired) and Jason McNamee

Rhode Island Division of Fish and Wildlife-Marine Fisheries, Jamestown, RI 02835

Email: cpowell7@verizon.net

Since 1985, the Rhode Island Division of Fish and Wildlife - Marine Fisheries Section has been conducting a comprehensive juvenile finfish survey of Narragansett Bay. Seining data collected annually from June through October at eighteen fixed stations around the bay indicate that the juvenile life stage of at least four species of flatfish utilize Narragansett Bay as a nursery area: winter flounder (*Pseudopleuronectes americanus*), summer flounder (*Paralichthys dentatus*), windowpane (*Scopthalmus aquosus*), and smallmouth flounder (*Eutropus microstomus*). Annual abundance analysis was done for each species for the entire time series. Due to over dispersion in the data, zero inflation (zero counts much higher than would be expected), and non-normality of the data, a zero inflated negative binomial model was used to develop an annual index of abundance for each species. Patterns of distribution and abundance for all four species were correlated with adjacent shoreline features, benthic habitat and geographic location in the estuary. Substrate, distance up the estuary, human population density and proximity to human disturbance were correlated with juvenile abundance. Overall, results indicate that juvenile flatfish in Narragansett Bay prefer specific habitat types and their annual abundance is influenced by a number of factors.

Going Digital: The Establishment and Application of a Digital Reference Collection for Atlantic Halibut (*Hippoglossus hippoglossus*) Otoliths

Trisha A. C. De Graaf[1*], Amanda Harden[2] and Betsy Grannis[3]

[1]*Maine Department of Marine Resources, 21 State House Station, Hallowell, ME 04333*

[2]*Unity College, 25 Wood Place, Unity, ME 04988*

[3]*Maine Department of Marine Resources*
194 McKown Point Road, PO Box 8, West Boothbay Harbor, ME 04575

Email: trisha.degraaf@maine.gov

The Maine Department of Marine Resources (DMR), Maine Sea Grant and participating Maine state waters fishermen and seafood dealers have collected over 1500 Atlantic halibut (*Hippoglossus hippoglossus*) otoliths in the nearshore Gulf of Maine waters since 2000. DMR established a fish ageing laboratory during 2008 with its first task that of processing the collected Atlantic halibut otoliths and establishing a digital reference collection to assist in updating much needed age-at-length estimates for this species. The primary purpose of the digital reference collection was to train DMR staff in ageing Atlantic halibut. This was a collaborative effort by staff from the Canadian Department of Fisheries and Oceans (DFO) at the Bedford Institute of Oceanography (BIO) and the International Pacific Halibut Commission (IPHC). Otoliths from varying size ranges of Atlantic halibut were embedded, sectioned, digitized, and aged by DMR's lead ager, then distributed to other ageing laboratories for comparative estimates. DFO and IPHC staff aged the collection independently and returned it to DMR with digital annotations and comments. DMR then evaluated the comparative estimates, reviewed comments, and re-aged the collection. An Inter-Reader Precision Test, developed by the Northeast Fisheries Science Center (NEFSC), was applied to compare age estimates between multiple agers. After improved percent agreements were achieved between DMR, DFO and IPHC estimates, the rest of the collection was aged. It was found that this effort was a cost effective approach to undertaking technical training that minimizes expenses and facilitates collaboration between different ageing institutions. Additional benefits and applications of the digital reference collection, improvements in comparative estimates between ageing institutions and updated age-at-length data will also be presented.

A Partial Recruitment History of Juvenile *Pseudopleuronectes americanus* in the Norwalk River Estuary From 1991 to the Present

Richard Harris, Gabe Rosen, Ali Luciani, Matt Luciani, Ian Kiefer, Amy Fleitz, Alex Sullivan, and Maddy von Zon Vleat

Earthplace, 10 Woodside Lane, PO Box 165, Westport, CT 06881

Email: r.harris@earthplace.org

Harbor Watch/ River Watch (HW/RW), a Program of Earthplace in Westport, Connecticut, in conjunction with students from Wilton High School, has run a survey of marine, juvenile benthic fish from 1991 until the present in the Norwalk River estuary. The program began in the summer of 1991 under the guidance of the State of Connecticut's Department of Environmental Protection's Fisheries Bureau. A trawling program was devised using fishing gear and a grid system, which divided the harbor into fishable boxes as devised by the Fisheries Bureau. Trawling in Norwalk Harbor was temporarily suspended due to extended boat repairs in the mid 1990's followed by a change in assignment for the HW/RW by the Fisheries Bureau toward the end of the decade. Trawling resumed in earnest during the summer of 2002 and has been continuous each year (May through October) to the present.

The early 1990's showed a harbor floor rich in diversity serving as a primary breeding ground and nursery for winter flounder (*P. americanus*). Numbers of species ranged from 12 to 15/ year. When HW/RW returned to trawling Norwalk Harbor in 2002, no fish of any species were found. From 2003 to mid 2005 a modest recovery of all benthic species began until August 15, 2005 when oxygen depletion in the upper harbor caused the loss of over 1 million menhaden (*Brevoortia tyrannus*). Since early 2006, catch per - unit of effort has decreased from ten fish per trawl in the early 1990's to one fish per - trawl during the last five years. The number of benthic species has also declined from 15 to 3 species during the same time frame. In spite of rising water temperatures, *P. americanus* is still the dominate fish with the northern pipefish (*Syngnathus fuscus*) and northern searobin (*Prionotus carolinus*) still in evidence. Most crustaceans have virtually disappeared from the trawls with the exception of blue crabs (*Callinectes sapidus*) and sand and shore shrimp (*Crangon septemspinosa* and *Palaemonetes vulgaris*). With the exception of temperature increases due to global warming, the cause for these dramatic changes is unknown.

Estimating Summer Flounder Mortality Rates Based on Mark-Recapture Data from a Recreational Angler Tagging Program

Mark J. Henderson*, Mary C. Fabrizio and Jon A. Lucy

Virginia Institute of Marine Science
P.O. Box 1346, Gloucester Point, VA 23062

Email: mhender@vims.edu

Managed as a single stock along the US Atlantic coast, summer flounder *Paralichthys dentatus* are currently under a rebuilding plan due to large declines in abundance observed in the early 1990s. Successfully rebuilding the summer flounder population requires implementing effective management practices based on accurate stock assessments. Currently, one major source of uncertainty in the summer flounder stock assessment is the estimate of the instantaneous natural mortality rate, which is calculated using life-history based models that have not been validated for this species. In this paper, we estimate an instantaneous natural mortality rate for summer flounder based on ten years of mark-recapture data collected by the Virginia Game Fish Tagging Program (VGFTP). The VGFTP relies on trained recreational anglers to tag and release popular game-fishes, including summer flounder, and recaptures are subsequently reported by recreational and commercial fishers. Over a period of 10 years (2000-2009), VGFTP participants tagged 62,048 summer flounder and 6,639 of these fish were recaptured. Using these data, capture and survival probabilities were estimated using the Barker tagging model, implemented with Program MARK. Not only do we estimate the natural mortality rate for summer flounder, but we also demonstrate that data from a recreational angler tagging program can be used to provide reliable estimates of mortality for stock assessments.

Application of the Auto-diametric Method of Estimating Fecundity to Winter Flounder, *Pseudopleuronectes americanus*

Dave McElroy*, Yvonna Rowinski, Mark Wuenschel, and Richard McBride

NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center
Woods Hole Laboratory, 166 Water Street, Woods Hole, MA 02543

Email: david.mcelroy@noaa.gov

The auto-diametric method is a relatively new and rapid process to measure fish fecundity, and has been used with other flounder species, but not winter flounder. Therefore the objectives of this study were: 1) to determine the best practices in handing, measuring, and analyzing the samples, 2) to develop the baseline calibration curves between mean diameter and number of yolked oocytes per gram of gonad (the auto-diametric relationship), and 3) generate preliminary estimates of potential annual fecundity (PAF) for two stocks of winter flounder. Monthly sampling was conducted with fish obtained principally through cooperative research with the commercial industry. Gonad samples were preserved in 10% buffered formalin and sub-samples of whole oocytes were processed and photographed using an image analysis system. These protocols attempted to generate consistent sample sizes of oocytes, high precision in diameter measurements, and account for the tunica in estimates of fecundity. Histological sections were used to confirm that females utilized were in the later stages of oocyte development with a distinct hiatus between developing (yolked) and primary-growth oocytes. Protocols for image quality and analysis were developed for rapid automated measurement of oocyte diameters utilizing ImageJ software. Auto-diametric relationships were similar between the two stock areas examined thus far; therefore, a combined curve was utilized to estimate relative fecundity. This auto-diametric regression enables future estimation and annual monitoring of relative fecundity on a larger production scale. Preliminary results for PAF revealed estimates of half a million to 2.5 million eggs per female, and a strong increase in fecundity with increasing female size was identified. Estimates of PAF suggest higher relative fecundity for Southern New England winter flounder than in the Gulf of Maine.

Development of 11 Microsatellite Primer Sets for Use in Exploring Gene Flow and Population Structure in Yellowtail Flounder (*Limanda ferruginea*)

Jonathan Breton[1*], Robert Drew, Richard McBride[2], and Ken Oliveira[1]

[1]*University of Massachusetts Dartmouth, Department of Biology*
285 Old Westport Road, North Dartmouth, MA 02747

[2]*NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center*
Woods Hole Laboratory, 166 Water Street, Woods Hole, MA 02543

Email: u_jbreton@umassd.edu

Yellowtail flounder are managed as three stocks in the United States: Georges Bank, Southern New England, and Cape Cod/Gulf of Maine. There have been several tagging studies that confirm the centers of biomass of these stocks; however, the most recent and most extensive tagging study shows limited migrations of adults between stocks, particularly across the Great South Channel. Movement patterns of larval yellowtail are largely unknown. We ask the following questions. First, do management stocks represent true populations? Second, what are the overall levels of gene flow between these stocks, or are migrating fish contributing to the spawning stock biomass? We developed 11 polymorphic microsatellite primers and are applying them to genetic samples collected from the three stocks and from a Canadian stock (Grand Banks) which is expected to be genetically isolated and distinct from the American stocks. A better understanding of gene flow between stocks will allow more informed management decisions as well as improve our biological understanding of this species.

Vestibular Asymmetry Precedes and is Dissociated from Eye Translocation during Flatfish (Bamboo sole, *Heteromycteris japonicus,* and Southern Flounder, *Paralichthys lethostigma*) Metamorphosis

Alex M. Schreiber[1*], Kriscinda Meadows[2], Isabella Bruno[1], and Tadehisa Seikai[3]

[1]*St. Lawrence University, Biology Department, Canton, NY 13617*

[2]*Gettysburg College, Biology Department, Gettysburg, PA 17325*

[3]*Fukui Prefectural University, Department of Marine Bioscience*
Obama, Fukui 917-0003 Japan

Email: aschreiber@stlawu.edu

The flatfishes are the world's most asymmetrically shaped vertebrates. They metamorphose from typical upright swimming, bilaterally symmetrical larvae, into their asymmetric adult form. This process is characterized by the gradual translocation of one eye to the opposite side of the head and a concurrent transition to a highly lateralized swim posture. Here we show that vestibular (inner-ear) asymmetry is already established before metamorphosis, and that visual information from bilaterally symmetrical eye positioning in larval flatfish is necessary for maintaining the upright swim posture in the presence of this vestibular asymmetry. These findings support the hypothesis that the flatfish ancestor was a bilaterally symmetrical fish with an already established lateralized behavior; craniofacial asymmetry and eye-migration likely evolved later to accommodate lateralized behavior.

Flatfish Recruitment to a Georgia Estuary

Austin W. Francis, Jr.

Armstrong Atlantic State University, Department of Biology
11935 Abercorn Street, Savannah, GA 31419

Email: austin.francis@armstrong.edu

Few studies have examined the role of Georgia's estuarine nursery areas in the recruitment of larval and juvenile flatfishes. To identify the temporal occurrence and abundance of flatfish recruitment to the Moon River, a tidal creek south of Savannah, an ichthyoplankton net was deployed one night a week from April 2009 until August 2010. Simultaneously, a zooplankton net was deployed to assess prey availability. Two deployments of 30 minutes each were made during a flood tide for both ichthyoplankton and zooplankton. Oceanographic conditions (including water depth, salinity, temperature, dissolved oxygen, and pH) were also determined. In the field, larval and juvenile flatfishes were preserved in 10% formalin. Zooplankton collections were vital stained with neutral red and subsequently preserved in 10% formalin. In the laboratory, ichthyoplankton samples were transferred to 70% ethyl alcohol and identified to the lowest possible taxon. Over a 14 month period, 94 flatfishes were collected representing just 0.49% of the total fish catch (14,833). The majority of flatfishes (73) were tonguefishes (Family Cynoglossidae) with the most common species *Symphurus plagiusa* (90.4%). Tonguefishes were present in samples from May to August of each year. The remaining 12 flatfishes were species of Paralichthyidae (including *Citharichthys spilopterus*, *Etropus microstomus*, *Paralichthys albigutta*, *Paralichthys dentatus*, and *Paralichthys lethostigma*). These large-tooth flounder were only present in samples from February to April. With only one exception, all flatfishes were late metamorphic larvae or post-metamorphic juveniles. The temporal occurrence of these two groups of flatfishes corresponds with previously published studies. There are no historical data on abundance, but the low representation of flatfishes in collections was unexpected.

Abstracts

Poster Presentations

Mercury and Selenium Relationships in Liver, Brain, and Muscle Tissue of Fish

Nichole Ares* and David Taylor

Roger Williams University
1 Old Ferry Road, Bristol RI 02809

Email: nares980@g.rwu.edu

Mercury (Hg) is a toxic environmental contaminant that negatively affects human health, and exposure occurs through the consumption of finfish. Selenium (Se) has a strong relationship with mercury, and is believed to have a mitigating effect on Hg toxicity. Hg levels have been previously investigated in the edible filets of fish, including species of flatfish, like the summer flounder (*Paralichythys dentatus*), but the Hg in other tissues, like the brain and liver are lacking. The brain is of particular concern since Hg is a neurotoxin. The liver may also be impacted by contaminants due to its role in detoxification. The relationship of Hg and Se has been investigated in some species, however overall, there is little known. This study concentrates on the differences observed between contaminant levels in summer flounder, bluefish (*Pomatomus saltatrix*) and black sea bass (*Centropristis striata*). The objectives of this study were to: (1) examine Hg and Se bioaccumulation within the three target tissues, (2) examine the molar ratios of Se:Hg within the tissues, and (3) compare the differences between species, and attribute them to life-history characteristics. From June to August 2007-2010, target fish were collected from Narragansett Bay (RI, USA). Length (cm) was recorded for each fish, and the total Hg was determined using a DMA-80 (direct mercury analyzer) which utilizes automated atomic absorption spectroscopy, and total Se using ICP-MS (inductively coupled plasma mass spectroscopy). Molar ratios of Se:Hg were calculated to determine the protective quality of Se over Hg toxicity, with a ratio ≥ 1 showing a protective quality of Se over Hg.

Evaluation of Bioelectrical Impedance Analysis to Predict Condition and Muscle and Liver Energy Content of Three Flatfishes: Winter, Yellowtail and Summer Flounder

Andrew Arruda[1*], Ken Oliveira[1], Mark Wuenschel[2], Dave McElroy[2], and Richard McBride[2]

[1]*University of Massachusetts Dartmouth, Department of Biology*
285 Old Westport Road, North Dartmouth, MA 02747

[2]*NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center*
Woods Hole Laboratory, 166 Water Street, Woods Hole, MA 02543

Email: aarruda@umassd.edu

Standard methods which are used to judge the condition of fish rely on simple length-weight data, and assume that at a certain length heavier fish are healthier. With this whole body method, seasonal changes in the allocation of energy to different tissues and organs (e.g. gonads, muscle, liver) within the body are not always evident. Bioelectrical impedance analysis (BIA) has been used in recent studies as a quick and non-lethal way to determine proximate composition and energy density of fish. Phase angle (the ratio of resistance and reactance of tissue to applied electrical current) is a BIA measure that has been related to fish condition. We evaluated relationships between BIA measures of resistance, reactance and phase angle to established indices of condition and proximate composition of muscle and liver tissue for three flatfishes (winter, yellowtail, and summer flounder). Samples collected over multiple seasons exhibited a range in overall condition. Both BIA and traditional measures of condition including gonado-somatic index (GSI), hepato-somatic index (HSI), and relative condition (K_n) were collected. In addition, proximate composition (percent water, lipid weight, and ash weight) of liver and muscle tissue was determined using gravimetric analysis. Neutral storage lipids were extracted from dried tissue samples in Soxhlet extractors with petroleum ether as the solvent. After extraction, samples were combusted in a furnace to determine lean tissue and ash content. The correlations between BIA measured phase angle, gross condition indices (GSI, HSI, and relative condition) and tissue proximate composition were analyzed to assess the utility of BIA as a rapid method to predict energetic status of these fishes. As expected, strong correlations between total fish weight and total energy content were observed for both liver and muscle. Strong relationships between the percentage water and lipid and energy content of tissues were evident, with some variation between species. However phase angle was not significantly correlated with any component of proximate composition analysis, questioning the utility of BIA to estimate condition in these flatfishes.

Estimation of Fecundity and Development of a Preliminary Fecundity Curve for Georges Bank Yellowtail Flounder (*Limanda ferruginea*)

Jonathan Breton[1]*, Richard McBride[2], Mark Wuenschel[2], Courtney Donovan[1], and Ken Oliveira[1]

[1]*University of Massachusetts Dartmouth, Department of Biology*
285 Old Westport Road, North Dartmouth, MA 02747

[2]*NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center*
Woods Hole Laboratory, 166 Water Street, Woods Hole, MA 02540

Email: u_jbreton@umassd.edu

Yellowtail flounder is a commercially important right-eyed flounder with populations ranging from the northeastern US to the Grand Banks in Canada. The United States and Canada manage three and two stocks each. Stock structure is based on differences in reproductive characteristics, such as age and size at maturity and fecundity. The most recent study of yellowtail flounder fecundity focused on the Southern New England stock during the mid 1970s. At that time, the volumetric method was used, which is a laborious process, and this is likely the foremost reason fecundity for this species has been overlooked. Recent advances in fecundity determination methods, such as the autodiametric method, utilize image analysis to count and measure oocytes and have streamlined the task of estimating fecundity. We have applied the autodiametric fecundity method to develop a preliminary relationship (oocyte density vs. oocyte diameter) for Georges Bank yellowtail, and have begun doing so for the remaining two US stocks. These relationships will allow the rapid estimation of oocyte density (#/g) from mean oocyte diameters which can be measured relatively easily from preserved gonad samples. This approach will permit the evaluation of fecundity in much greater detail (stock-specific and yearly) than has been previously possible.

Age Verification of Older Yellowtail Flounder from a Tagging Study

Sarah Emery[1]*, Sam Matulich[2], and Larry Alade[1]

[1]NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center
Woods Hole Laboratory, 166 Water Street, Woods Hole, MA 02543

[2]Humboldt State University, Department of Biological Sciences
One Harpst Street, Arcata, CA 95521

Email: semery@mercury.wh.whoi.edu

The accuracy of age estimation of older yellowtail flounder has historically been problematic. Current US stock assessments of yellowtail combine age 6 and older fish into a plus group. While previous tagging studies validated the formation of one annulus per year, few fish older than age 4 were included in these investigations. From 2003-2005, over 45,000 yellowtail flounder were tagged in all three stock areas off New England. Approximately 4,000 scale samples were taken from the released fish; 131 samples have since been collected from recaptured fish. Scale samples from recaptured fish that were at least 5 years old at the time of release were subsequently aged. Ages from recaptured fish ranged from 5 to 7 years. The ageing results verify that only one annulus is formed per year.

Mortality, Growth, and Condition of Young-of-the-Year Winter Flounder in Long Island Bays

Lyndie Hice[1], Anne McElroy[1], Mark Fast[1, 2], and Michael Frisk[1]

[1]Stony Brook University, School of Marine and Atmospheric Sciences
Stony Brook, NY 11794

[2]Atlantic Veterinary College, University of Prince Edward Island
Department of Pathology and Microbiology, Charlottetown, PEI, C1A 4P3, Canada

Email: lhice@ic.sunysb.edu

Winter flounder (*Pseudopleuronectes americanus*) once supported an important recreational and commercial fishery on Long Island; however, in recent years, populations have reached record low numbers. The aim of the present study was to investigate biological, environmental, and anthropogenic factors influencing the survival of young-of–the-year (YOY) winter flounder in Long Island bays. Samples were collected during bi-weekly beam trawl surveys from June to October 2010 in Jamaica Bay, Moriches Bay, Shinnecock Bay, Cold Spring Pond (Peconic Bay), and Napeague Harbor. Preliminary data show percent daily mortality ranged from 0.97-3.79 among the five sampling areas and a positive relationship between mortality and peak density. Additionally, length frequency analysis shows evidence of prolonged spawning and varying cohort strength among the sites. Otolith analysis to determine hatching dates and growth rates will also be presented as well as preliminary results on site-specific condition indices, RNA/DNA ratios, and muscle lipid content. Once completed, this two year project should provide managers with information on which factors contribute most to YOY growth and survival of this important resource species.

Characterization of Fillet Bruising Patterns in Commercially Harvested Yellowtail Flounder (*Limanda ferruginea*)

Jessica Kenney

Memorial University of Newfoundland
St. John's, NL, Canada A1B 3X7

Email: jessica.kenney@mi.mun.ca

The commercial flounder fishing industry has been an extremely integral part of Newfoundland's economy since the 1960's. This industry experiences a loss of efficiency when unnecessary fillet damage is inflicted through harvesting and processing techniques. Fillet bruising is results when physical and/or physiological trauma causes blood vessels to rupture and blood residue to pool in certain locations. This bruising detracts from retail value, and thus must be trimmed away prior to packaging and distribution. The trimming process leads to a decrease in fillet size, and consequently a loss in total yield and profit. In an effort to minimize this loss, the circulatory system of the flounder was modeled using latex, and an analysis of current fillet bruising patterns was done using multispectral imaging. The model was then compared to the results of the image analysis to determine where the bruising is occurring most often, and as a result of which blood vessels. The results of this study may have implications for current harvesting and processing techniques in the commercial flounder industry.

Seasonal Use of a Shallow Estuarine Creek by Flatfishes

Robert Kiser* and Mary Carla Curran

Savannah State University, Marine Science Program
Department of Natural Sciences, Savannah, GA 31404

Email: rkiser1016@gmail.com

Estuarine creeks are often used as nurseries by young flatfish. The purpose of this study was to investigate whether flatfish species composition and abundance varied with season within a shallow estuarine creek. Sampling was conducted during ebb tide from January 2004 to August 2010 in Wylly Creek (31°59'52"N, 81°03'18"W) located in Savannah, GA. Three replicate tows were conducted using a 1-m beam trawl. Water temperature, salinity, and dissolved oxygen levels were obtained. Flatfishes were identified to species and total length was measured. Significantly ($p<0.05$) more *Symphurus plagiusa* were collected during summer (12.90 ± 2.71 CPUE) than during the other seasons. Although 48% of the *Citharichthys spilopterus* collected were obtained during winter, their abundance did not vary significantly by season. However, measurements of total length found that *C. spilopterus* were smaller during winter (18.16 ± 0.45 mm) and larger during fall (81.93 ± 5.30 mm). *Etropus crossotus* were significantly ($p<0.05$) more abundant during summer (1.95 ± 0.53 CPUE) than winter (0.11 ± 0.11 CPUE). Total length measurements for *Paralichthys lethostigma* showed that fish size was greater in fall (171.00 mm) and smaller in winter (27.13 ± 2.80 mm). The same was true for *Paralichthys dentatus* which were larger during fall (98.00 ± 16.34 mm) and smaller in winter (30.78 ± 1.70 mm, $p<0.05$). Abundance and size of certain flatfishes within a shallow estuarine creek varied by season and not all of these flatfish species appear to use this area as a nursery.

Macroscopic and Microscopic Investigations of the Reproductive Organs in Dab *Limanda limanda*

Laura Langan

Commercial Fisheries Research Group, Marine and Freshwater Research Centre Galway Mayo Institute of Technology, Dublin Road, Co, Galway, Ireland

Email: laura710@msn.com

Current management of fish populations relies heavily on the correct interpretations of spawning stock biomass, the basis of which is an accurate maturity ogive for the species being investigated. Maturity ogives are calculated through macroscopic evaluation of gonads, but in order for accuracy to be achieved, the histology of the gonad must first be studied in order to validate the macroscopic criteria. The dab *Limanda limanda* is a commercially important species in Europe however maturity ogives in use for this species date from over four decades ago, or in some cases where the species is not commercial such as Ireland, a maturity ogive for plaice *Pleuronectes platessa* is used instead, thereby reducing the accuracy of future management assessments.

Indexes such as the hepatosomatic and the gonadosomatic index were used to indicate spawning periods while a microscopic scale for histological studies has been developed to improve the accuracy of the macroscopic scale.

This study will feed into future stock assessment models and will provide a baseline to understand the complex interactions of different populations, factoring in different abiotic factors affect on populations densities, spawning times and spawning stock, while playing an important role in future management of the stock.

Temporal-spatial Patterns of Tagged Summer Flounder (*Paralichthys dentatus*) in Virginia Waters and Migration to Mid-Atlantic Waters (2007-2010)

Jon Lucy[1*] and Lewis Gillingham[2]

[1]Virginia Institute of Marine Science, College of William and Mary
PO Box 1346, Gloucester Point, VA 23062

[2]Virginia Saltwater Fishing Tournament, Virginia Marine Resources Commission
681 Oriole Drive, S., Virginia Beach, VA 23451

Email: lucy@vims.edu

Angler-assisted tagging of summer flounder, *Paralichthys dentatus*, in Virginia's Chesapeake Bay and nearshore-offshore waters has occurred for ten years under the Virginia Game Fish Tagging Program. A cooperative effort between VIMS (Virginia Institute of Marine Science) and VMRC (Virginia Marine Resources Commission), the program's funding is primarily from state saltwater fishing license revenues. For 2007-2009, flounder data include tagged fish records for approximately 8,500, 7,800 and 9,200 fish (mostly sub-legal ≤ 470-483 mm TL). Recaptures during 2007-2009 (1,030,850 and 1,095 events, respectively, including multiple recaptures) contributed to annual cumulative recapture rates of 8.7-9.4% for the three-year period. Time to recapture for tagged flounder ranged from a few days to several months within the year fish were tagged. During the year following tagging, 5-8% of recaptures occurred again in Virginia's Bay and ocean inlet waters. In the same period, 0.4-1% of recaptures occurred in offshore and coastal waters of states from southern New England to South Carolina. Recapture time for fish ranged from several months up to a year or more post tagging. Tagged fish data document when and where younger year classes of flounder become available to Virginia anglers during spring-summer months, including sometimes young-of-the-year fish. Within-year and year-to-year patterns of local movements (and site fidelity) are presented. Coastwise recaptures of Virginia-tagged flounder are compared to results from other tagging studies.

Beyond '*Flatland*': A Multi-dimensional Approach to Classify Female Winter Flounder (*Pseudopleuronectes americanus*) Maturity and Reproductive Seasonality

Richard McBride[1*], Mark Wuenschel[1], Dave McElroy[1], Yvonna Rowinski[1], and Jeremy King[2]

[1]NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center Woods Hole Laboratory, 166 Water Street, Woods Hole, MA 02543

[2]Massachusetts Division of Marine Fisheries 1213 Purchase Street, New Bedford, MA 02740

Email: richard.mcbride@noaa.gov

Preservation of spawning stock biomass is a central fishery management goal, but this requires data identifying non-spawning and spawning components of a stock. Size and age at maturity can change over time, and some mature fish may not spawn annually, so regular monitoring of these traits is necessary. Many different maturity classification schemes have been developed by the NEFSC (Northeast Fisheries Science Center) and other fisheries agencies, with as few as four and as many as ten maturity classes:

http://www.nefsc.noaa.gov/nefsc/publications/tm/tmfnec76.pdf
and http://www.ices.dk/reports/ACFM/2007/WKMAT/WKMAT07.pdf .

These schemes rely on macroscopic characters such as gonad color, texture, size, etc. Like the two-dimensional world, *Flatland*, envisioned by E. A. Abbott, this dependence on common, visual traits is limited or even misleading. In this poster we present two schemes, previously outlined by Wuenschel et al. (2010; pp: 103-107; http://hdl.handle.net/10261/24937), that document the key characters observable from dissected fish and gonad histology. As in Flatland, when square met sphere, we found that gonad histology revealed aspects of oogenesis, oocyte diameters, follicular atresia, and thickness of the gonad wall that were unknowable from macroscopic observations. Histological characters allow a more accurate and precise characterization of maturity classes. Although the costs of gonad histology prevent its routine use, histology can verify and redefine cheaper and quicker methods.

Abundance and Density of the Winter Flounder (*Pseudopleuronectes americanus*) in Cedar Island Marina, Clinton Harbor Connecticut

Beth Patrizzi* and Michael Gilman

Cedar Island Marina Research Laboratory, Clinton, CT 06413

Email: beth.patrizzi@gmail.com

Winter flounder (*Pseudopleuronectes americanus*) are typically found inshore in fall and early winter and migrate offshore during spring and summer. Clinton Harbor, Connecticut, a nursery ground for *P. americanus,* also supports a winter flounder population throughout the summer months. From January 2010 to August 2010, beam trawling was conducted at 8 sites within Cedar Island Marina and adjacent mudflats in Clinton Harbor. *P. americanus* was found as early as May with a mean total length of 37 mm. An increase in size was observed throughout the study with a mean total length of 65.7 mm in August. On average winter flounder within the marina were larger (58.0 mm TL) than those found on mudflats (51.6 mm TL). More than half (62%) of the specimen caught were located on mudflats. The abundance of *P. americanus* was highest during June (N=26) and July (N=23).

Measures of Immune System Status in Young of the Year Winter Flounder from Long Island Coastal Bays

Jaime Romany[1], Mark Fast[1, 2], and Anne McElroy[1*]

[1]Stony Brook University, School of Marine and Atmospheric Sciences
Stony Brook, NY 11794

[2]Atlantic Veterinary College, Department of Pathology and Microbiology
University of Prince Edward Island, 550 University Avenue
Charlottetown, PEI, C1A 4P3 Canada

Email: amcelroy@notes.cc.sunysb.edu

Stocks of the winter flounder (*Pseudopleuronectes americanus*) are near record lows in many areas of the Northeast. One important period in the development of these fish is the time from settlement through their first summer of growth. During this time young-of-the-year (YOY) fish may be more sensitive to assault from pathogenic bacteria and co-exposure to contaminants or degraded habitats could weaken their defense systems. We attempted to evaluate immune status of YOY winter flounder from six areas around Long Island, including Jamaica Bay, Little Neck Bay, Manhasset Bay, Oyster Bay, Port Jefferson, and Shinnecock Bay, sites geographically distributed from west to east, representing a large gradient in urbanization, and thus likely contaminant inputs from the water shed. Previous work in our laboratory has shown that YOY flounder and adult silversides (*Menidia menidia*) show evidence of feminization from some of these areas. Fish were collected from June to October, and expression of pleurociden, a gene coding for an antimicrobial peptide found in skin mucous, as well as antimicrobial activity of skin mucous were assessed in individual fish from each site. Cytochrome P4501a (Cyp1a) expression was also measured as an indicator of contaminant exposure in these fish. Gene expression was quantified using RT-qPCR, and antimicrobial activity was assessed using a growth assay with *Vibrio anguillarum* and *V. parahaemolyticus*, two common marine bacteria known to affect winter flounder. Pleurociden expression was much higher in fin tissue than in liver tissue, was highly variable between individual fish, and demonstrated no clear site specific differences associated with degree of urbanization of the watershed. Expression seemed to be related in part to fish size, with the few number of larger fish analyzed showing higher expression levels indicating that immune competency increases with age. Antimicrobial activity was also highly variable, showing no large site specific differences, and no clear correlation to pleurociden expression. Cyp1a expression did not indicate any large differences in contaminant exposure between the sites. These data suggest that either pleurociden expression in YOY winter flounder is constitutive and not influenced by contaminant exposure in the environment, or that contaminant exposure did not vary significantly between the sites evaluated. Further work is needed to characterize factors controlling pleurociden expression, as well as other indicators of immune response in young fish.

A Histological Atlas of Female Winter Flounder (*Pseudopleuronectes americanus*) Oogenesis

Yvonna Rowinski*, Richard McBride, Mark Wuenschel, and Dave McElroy

NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center
Woods Hole Laboratory, 166 Water Street, Woods Hole, MA 02543

Email: yvonna.rowinski@noaa.gov

Patterns of winter flounder reproductive maturation and seasonality are relatively well understood. Nonetheless, detailed images of winter flounder oogenesis have not been published, which impedes comparisons between studies, labs, etc. Here we present an atlas of the main stanzas of oogenesis: 1) oogonial proliferation and folliculogenesis; 2) the transition from primary to secondary growth oocytes; 3) maturation of the oocyte; 4) ovulation and degradation of the post-ovulatory follicle; and 5) follicular atresia. Thin sections of ovary tissue are presented using two staining methods: 1) hematoxylin and eosin stain and 2) Schiffs-Mallory Tricrome. Tissue samples examined were selected from fish in four distinct regions: Gulf of Maine, Georges Bank, southern New England, and Long Island Sound.

Growth and Maturation of Winter Flounder along the Coasts of Maine and New Hampshire

Sally Sherman* and Keri Stepanek

Maine Department of Marine Resources
PO Box 8, West Boothbay Harbor, ME 04575

Email: sally.sherman@maine.gov

Now in its 11th year, the MENH Inshore Trawl Survey is the longest continuous time series of its type within the coastal waters of Maine and New Hampshire. Conducted biannually, its overall goal is to provide a quantitative time-series on the distribution and relative abundance of benthic marine resources in these waters and is a successful collaboration between commercial fishermen from Maine and New Hampshire and state resource scientists. Winter flounder, *Pseudopleuronectes americanus*, catches have been fairly consistent throughout the 10 years of the survey. Survey indices, distribution and length frequency data have been provided to both the Atlantic States Marine Fisheries Commission and to assessment scientists for use in managing the Gulf of Maine stock. In addition, biological samples such as otoliths, sex, and maturity stages have been collected on a portion of the winter flounder since 2001. This poster will look at potential differences of sizes and maturity rates within the survey area. Age estimations performed on a subset of the otoliths will also be presented.

The Seasonal and Spatial Variability of Flatfish Feeding Habits on the Northeast US Continental Shelf: Preliminary Insights from Cooperative Research

Brian E. Smith, Joshua Dayton*, David McElroy, Emilee Towle, and Richard McBride

NOAA's National Marine Fisheries Service, Northeast Fisheries Science Center Woods Hole Laboratory, 166 Water Street, Woods Hole, MA 02543

Email: joshua.dayton@noaa.gov

Flatfish are a commercially and ecologically important component of benthic communities particularly for the northeast US (NEUS) continental shelf. These species provide major links between the benthos and upper trophic level predators of this system, and they are direct targets of economic value. Despite their roles, few studies have examined the broad-scale variability of flatfish feeding on the NEUS continental shelf with the benefits of processing stomach samples exclusively in the laboratory. We evaluated the feeding habits of three flatfish species: summer flounder (*Paralichthys dentatus*), yellowtail flounder (*Limanda ferruginea*), and winter flounder (*Pseudopleuronectes americanus*) collected in cooperation with the fishing industry by geographic area (Southern New England, Georges Bank, and Gulf of Maine) and season (fall, winter, spring, and summer). Preliminary results from 10 months of sampling suggest the general diet of summer flounder is primarily composed of squid (*Loligo pealii*) and various fishes (silver hake [*Merluccius bilinearis*], *Urophycis* spp., and *Prionotus* spp.). In contrast, yellowtail and winter flounder diets had three prominent invertebrate prey taxa present: Gammaridea, Polychaeta, and Actiniaria. Few differences in the total amount of stomach contents were detected across the geographic regions sampled for yellowtail and winter flounder. However, marked variations in seasonal total stomach contents were observed for summer flounder and winter flounder. Interestingly, seasonal and regional differences in diet composition were not highly significant for these species and suggest that additional explanatory variables may be worth investigating given further sampling (e.g. predator size-categories, spawning condition, and monthly feeding variability).

Behavioral Interactions between Flatfish and Commercial Ground Gear on the Newfoundland Grand Bank

Melanie J. Underwood*, Paul D. Winger, George Legge, and Stephen J. Walsh

Fisheries and Marine Institute of Memorial University
PO Box 4920, St. John's, NL, A1C 5R3, Canada

Email: melanie.underwood@mi.mun.ca

The yellowtail flounder (*Limanda ferruginea*) fishery on the Newfoundland Grand Bank is currently limited by bycatch restrictions, in particular non-recovering American plaice (*Hippoglossoides platessoides*). In recent years, behavioral research of target species and their interactions to the harvesting gear have led to gear modifications that reduce bycatch. In preparation for gear modifications, *in situ* camera work was conducted on the Grand Bank, during June and September 2010, to observe and quantify the relationship between flatfish behavior and harvesting gear. A high definition (HD 1080i/720p), digital camera system developed for this research was secured onto the headline of a commercial flatfish trawl. Individuals of different size classes were observed entering the mouth of the trawl, then analyzed using Observer XT 10. It is anticipated that behavioral differences between species and sizes will lead to a trawl designed to reduce American plaice bycatch and undersized yellowtail flounder.

An Examination of Winter Flounder (*Pseudopleuronectes americanus*) Decline in Three Western Long Island Bays

Josh Zacharias, Lyndie Hice, and Michael Frisk

Stony Brook University, School of Marine and Atmospheric Sciences
Stony Brook, NY 11794

Email: jzachari@ic.sunysb.edu

Winter flounder (*Pseudopleuronectes americanus*) are an important demersal species on Long Island that are presently experiencing a population collapse with 2009 abundance numbers at 3.4% of 1986 levels. A catch per unit effort (abundance) analysis using the New York State Department of Environmental Conservation's Western Long Island seine survey was undertaken to evaluate winter flounder populations. This database spans 23 years (1986-2009) and includes Jamaica, Little Neck and Manhasset bays. Age 1 and older winter flounder abundance declined over the length of the study; however, three periods can be recognized. A steep decline in abundance occurred from 1986-1995, followed by a lesser rate of decline from 1996-2005, and a drastic decline from 2006-present. Abundance of recently settled YOY flounder remained steady during the first period and increased slightly during the 1990s and early 2000s. However, this increased production did not result increase the number of YOY surviving into the fall and YOY abundance declined after 2006. Preliminary results linked various factors to this decline, including relationships between adult striped bass (*Morone saxatilis*) and YOY winter flounder as well as the impact of warming water temperatures on growth; however, further investigation is required.

Procedures for Issuing Manuscripts in the *Northeast Fisheries Science Center Reference Document* (CRD) Series

Clearance

All manuscripts submitted for issuance as CRDs must have cleared the NEFSC's manuscript/abstract/webpage review process. If any author is not a federal employee, he/she will be required to sign an "NEFSC Release-of-Copyright Form." If your manuscript includes material from another work which has been copyrighted, then you will need to work with the NEFSC's Editorial Office to arrange for permission to use that material by securing release signatures on the "NEFSC Use-of-Copyrighted-Work Permission Form."

For more information, NEFSC authors should see the NEFSC's online publication policy manual, "Manuscript/abstract/webpage preparation, review, and dissemination: NEFSC author's guide to policy, process, and procedure," located in the Publications/Manuscript Review section of the NEFSC intranet page.

Organization

Manuscripts must have an abstract and table of contents, and (if applicable) lists of figures and tables. As much as possible, use traditional scientific manuscript organization for sections: "Introduction," "Study Area" and/or "Experimental Apparatus," "Methods," "Results," "Discussion," "Conclusions," "Acknowledgments," and "Literature/References Cited."

Style

The CRD series is obligated to conform with the style contained in the current edition of the United States Government Printing Office Style Manual. That style manual is silent on many aspects of scientific manuscripts. The CRD series relies more on the CSE Style Manual. Manuscripts should be prepared to conform with these style manuals.

The CRD series uses the American Fisheries Society's guides to names of fishes, mollusks, and decapod crustaceans, the Society for Marine Mammalogy's guide to names of marine mammals, the Biosciences Information Service's guide to serial title abbreviations, and the ISO's (International Standardization Organization) guide to statistical terms.

For in-text citation, use the name-date system. A special effort should be made to ensure that all necessary bibliographic information is included in the list of cited works. Personal communications must include date, full name, and full mailing address of the contact.

Preparation

Once your document has cleared the review process, the Editorial Office will contact you with publication needs – for example, revised text (if necessary) and separate digital figures and tables if they are embedded in the document. Materials may be submitted to the Editorial Office as files on zip disks or CDs, email attachments, or intranet downloads. Text files should be in Microsoft Word, tables may be in Word or Excel, and graphics files may be in a variety of formats (JPG, GIF, Excel, PowerPoint, etc.).

Production and Distribution

The Editorial Office will perform a copy-edit of the document and may request further revisions. The Editorial Office will develop the inside and outside front covers, the inside and outside back covers, and the title and bibliographic control pages of the document.

Once both the PDF (print) and Web versions of the CRD are ready, the Editorial Office will contact you to review both versions and submit corrections or changes before the document is posted online.

A number of organizations and individuals in the Northeast Region will be notified by e-mail of the availability of the document online.

Research Communications Branch
Northeast Fisheries Science Center
National Marine Fisheries Service, NOAA
166 Water St.
Woods Hole, MA 02543-1026

MEDIA
MAIL

Publications and Reports of the Northeast Fisheries Science Center

The mission of NOAA's National Marine Fisheries Service (NMFS) is "stewardship of living marine resources for the benefit of the nation through their science-based conservation and management and promotion of the health of their environment." As the research arm of the NMFS's Northeast Region, the Northeast Fisheries Science Center (NEFSC) supports the NMFS mission by "conducting ecosystem-based research and assessments of living marine resources, with a focus on the Northeast Shelf, to promote the recovery and long-term sustainability of these resources and to generate social and economic opportunities and benefits from their use." Results of NEFSC research are largely reported in primary scientific media (*e.g.*, anonymously-peer-reviewed scientific journals). However, to assist itself in providing data, information, and advice to its constituents, the NEFSC occasionally releases its results in its own media. Currently, there are three such media:

NOAA Technical Memorandum NMFS-NE -- This series is issued irregularly. The series typically includes: data reports of long-term field or lab studies of important species or habitats; synthesis reports for important species or habitats; annual reports of overall assessment or monitoring programs; manuals describing program-wide surveying or experimental techniques; literature surveys of important species or habitat topics; proceedings and collected papers of scientific meetings; and indexed and/or annotated bibliographies. All issues receive internal scientific review and most issues receive technical and copy editing.

Northeast Fisheries Science Center Reference Document -- This series is issued irregularly. The series typically includes: data reports on field and lab studies; progress reports on experiments, monitoring, and assessments; background papers for, collected abstracts of, and/or summary reports of scientific meetings; and simple bibliographies. Issues receive internal scientific review and most issues receive copy editing.

Resource Survey Report (formerly *Fishermen's Report*) -- This information report is a regularly-issued, quick-turnaround report on the distribution and relative abundance of selected living marine resources as derived from each of the NEFSC's periodic research vessel surveys of the Northeast's continental shelf. This report undergoes internal review, but receives no technical or copy editing.

TO OBTAIN A COPY of a *NOAA Technical Memorandum NMFS-NE* or a *Northeast Fisheries Science Center Reference Document*, either contact the NEFSC Editorial Office (166 Water St., Woods Hole, MA 02543-1026; 508-495-2350) or consult the NEFSC webpage on "Reports and Publications" (http://www.nefsc.noaa.gov/nefsc/publications/). To access *Resource Survey Report*, consult the Ecosystem Surveys Branch webpage (http://www.nefsc.noaa.gov/femad/ecosurvey/mainpage/).